

ASHRAE Summer Meeting San Antonio 2012 Forum #2, TC9.9 as Sponsor  
**Will Standard 90.1 Help or Hurt the Data Center Industry?**

**Forum Moderator: David Quirk, Chair TC9.9**

**Ground Rules:**

All forum participants must remain anonymous

For all recorded comments, the background of the commenter has been listed (Owner, Consultant, Design/Build, etc, rather than specific names)

**Initial Moderator Slides and Comments**

Will datacom HVAC Innovation be killed?

Prescriptive Path has little flexibility

Can risks still be managed?

Are economizers an appropriate minimum?

Should adiabatic humidification be a minimum?

Are the costs justified?

What about impact on schedules / AHJ approvals?

How steep is the learning curve for the industry?

Should Data Centers be excluded from 90.1?

Should Data Centers be included in separate chapter?

Should Data Centers be included in a separate standard?

**Forum Discussion**

Design/ Build: Data Centers have become like industrial spaces, less like commercial spaces. ASHRAE has been geared toward commercial spaces. In data centers energy is the number one cost component of TCO. Do we need rules in the data center industry? Doesn't a building code make it harder to do the job? The example provided: throwing away the \$100 bill...is it illegal littering or just poor handling of money? Data center builders are too smart to waste this energy; they will do this on their own, without regulation.

Owner: Sees a philosophical problem, especially around economizers. The industry would be fine with the shell of the data center complying with 90.1. Is there a risk associated with 90.1 compliance? There are unknowns, so the move to bring data centers into the code should be slow.

Design / Build: There should be a standard, but should it be enforced as code? People should be free to choose. They should not be put into the position of increased risk / losing money.

Owner/ Telecom: In Southern Climates, the number of hours to cool with outdoor air is minimal. Cost to retrofit with economizers is high. In other places, the costs might be reasonable. Economizers give the added advantage of smoke removal.

Consultant: Not convinced that saving money is really the driving force. It may be for the very large cloud providers, but he knows many clients who will not spend the money to save energy. Financial drive alone is not going to solve the problem. Analogy of two gas stations not far from each other, one is \$0.50-\$0.75 higher than the other yet people still buy gas there. We are talking about environment as well as money. How to do it?

Prescriptive approach can put handcuffs on innovation. People aren't aware of how innovative the data center industry is. TC9.9 has recommended an alternate approach (PUE).

University: 90.1 may not be completely aware of the specifics of data centers. Maybe TC9.9 should be the venue for creating the standard for data center efficiency because TC9.9 knows more. Why doesn't TC9.9 develop the standard ourselves?

CFD Firm: Being realistic – for many data centers it will never be top priority to save energy due to the risk of downtime, so a standard may be required. A prescriptive path is crazy. There is too much diversity in site selection, design, etc. A few examples could be a good idea, and then require the data center planner to prove they have saved energy.

Moderator: Many comments are anti-90.1. Need to hear from others with opposing viewpoints.

Consultant: What are the "special systems" in a data center? Chilled water, pumping, etc. are fairly standard systems. Failures occur not because of what has been specified, but because of moving parts and poor maintenance. That's why we have N+1, N+2, etc. So what are the specific things that are not properly addressed by 90.1?

Consultant: 90.1 has taken measures to address data centers. For example, in Atlanta a commercial building of a certain size needs an economizer but a data center of same load does not. There are quirks in the way that 90.1 is worded. Person does not agree with the assertion that 90.1 prohibits refrigerant. A refrigerant economizer does meet the intent of the code, but is not in the code. It could be remedied with a simple word change. Increased communication is the key. Issues related to data centers do not necessarily need to be dismissed out of hand all the time.

Consultant: Previous comments expose a fallacy that data centers don't need chillers. Data centers do not need to cool to human comfort. We are still talking about IT equipment comfort zones. If following the prescriptive approach, it is difficult. If not using mechanical cooling at all, why go through all the prescriptive requirements? If 95 F is acceptable, then show a performance based approach that can be scaled up. But don't require a lot of extraneous calculations for mechanical systems that don't help you accomplish your cooling goals.

National Lab: 90.1 is a minimum code. It can be set pretty low. It's not the best we can do. A lot of the misunderstanding is that people haven't read the whole code. There is also a performance standard. Appliance standards have greatly improved appliance energy efficiency over time. They have saved consumers money and not hurt the manufacturers.

Consultant: 90.1 applies to spaces that are heated or cooled. If a data center or switch gear room is only being ventilated (no mechanical cooling), does Standard 90.1 even apply?

Moderator: The AHJ makes that decision of 90.1 applicability.

Consultant: 6-7 yrs ago data centers were very monolithic and colder. Now we have many different approaches and temperatures. We have perhaps the most innovative field in the US. The prescriptive path can stifle innovation. Person is a proponent of performance based code – PUE goal for a specific region. How to meet that is up to the builder and the owner.

Moderator: How many people have used the alternative compliance path? Four people raised their hands. The vendors of the modeling tools used for alternate compliance path have told us they can't support data centers. Pumped refrigerant cannot be modeled with standard software packages.

Software vendor: Please share your experiences with fitting data centers into ACP.

Consultant: There is no way to model some of these systems, so we end up doing a very hybrid model with ECB and some custom calculations. Calculations are sent to a board for approval. Extra calculations need to be submitted and approved, but customers don't want to wait for these approvals. For example, pumped refrigerant and DX with sensible heat wheels. A performance based model would be easier to match.

Consultant: In California, we cost justified not having an economizer because the rest of the data center was so efficient. Many data centers want LEED, which requires a lot of modeling. How do you get any energy points in LEED (189) where plug loads are 60% or more of the total? Plug loads for 90.1 need to be addressed. Requires extra money for efficient equipment and extra time spent modeling.

Consultant: Occasions where we have done modeling have usually been to achieve LEED. Client organization's staff documented the IT equipment savings (virtualization, cloud computing). This counted more toward LEED than the cooling system energy. The Green Building Council accepts it, not the mechanical calculations.

Quick Polls:

Who in audience Owns/ operates/ designs data centers? 75% of audience

With economizer? Most.

Many air side, Many water side. About a 50/50 mix.

Who uses humidification?

Adiabatic, Steam. About a 50/50 mix.

Several with no humidification at all.

Consultant: A lot of progress has been customer driven over the years. E.g., using a swamp cooler in Chicago for a Telco, radiant heaters in the outside plenum to handle snow. The models aren't set up to deal with this. When comfort cooling is insufficient, people complain. In a Data Center, if one loses an economizer, it potentially has a big impact. The prescriptive path is a slow cumbersome path for an industry that is moving very fast; where everybody is paying attention and knows what their peers are doing. It takes 3 years to upgrade the standard, which is not fast enough. Right now we are chasing so much energy thru an ANSI process. ASHRAE in general needs more performance standards for many industries. ASHRAE should take a hard look at what they are doing, and really push innovation with a performance standard and use the prescriptive path to keep people from cheating the system.

Moderator: Why don't you like 90.1 addressing data centers?

Consultant: There are reasons in engineering to do different things in different ways. Any time you have a prescriptive approach to doing something, there is a contradiction with innovation.

University: For people who did not use economizers, why not?

Consultant: They weren't required until this past year.

Consultant: What is the climate, ROI? If the math doesn't work, don't use an economizer.

Consultant: Risk (economizers can add operational risk). It is not just your telephone, but also national defense, etc. Truly mission critical – mission and lives are at stake (unacceptable risk).

Manufacturer: There are probably a lot of smaller data centers that evolved over time and didn't put in economizers. The IT department would throw more HVAC at it. No one will do anything unless there is some guidance through codes. A little roadmap is needed for the small guys, but we should recognize that the larger data centers know what they are doing.

Consultant: I'm happy to design any system with an economizer. Adding an economizer can reduce risk because if all else fails you can bring in outside air, though dew point can be an issue. But why don't clients want economizers? The water-side economizer has a 12-year payback, the air-side economizer has a 20-year payback. If a client builds someplace where electricity is cheap, there won't be a good ROI on any type of economizer. If a simple DX system works and costs so little, why do anything different?

Moderator: Where do we go from here? We want a minimum energy efficiency requirement, mostly to get the small guys up to par without stifling innovation for the big guys. We don't want to slow down the bleeding edge or create unacceptable risk. Needs to be enforceable, measurable, benchmarked. So what's the answer? How do we do this?

Consultant: This is an industrial process, and we should treat it as one. There are so many different factors and weather conditions. The overall picture should be presented in terms of saving money to the stakeholders.

Moderator: Should there be a prescriptive requirement? Pre-modeling or post measurement?

National Lab: The world is adopting ISO standard 50000-1 - Continuous improvement. There is no metric for compute per watt over time yet. How does computer per watt improve over time? Measure what we do today and how it improves over time. Challenge to group to develop these metrics.

Moderator: Thank you and closing. Stated that this forum is not to be recorded. Announced TC9.9 meeting later today.