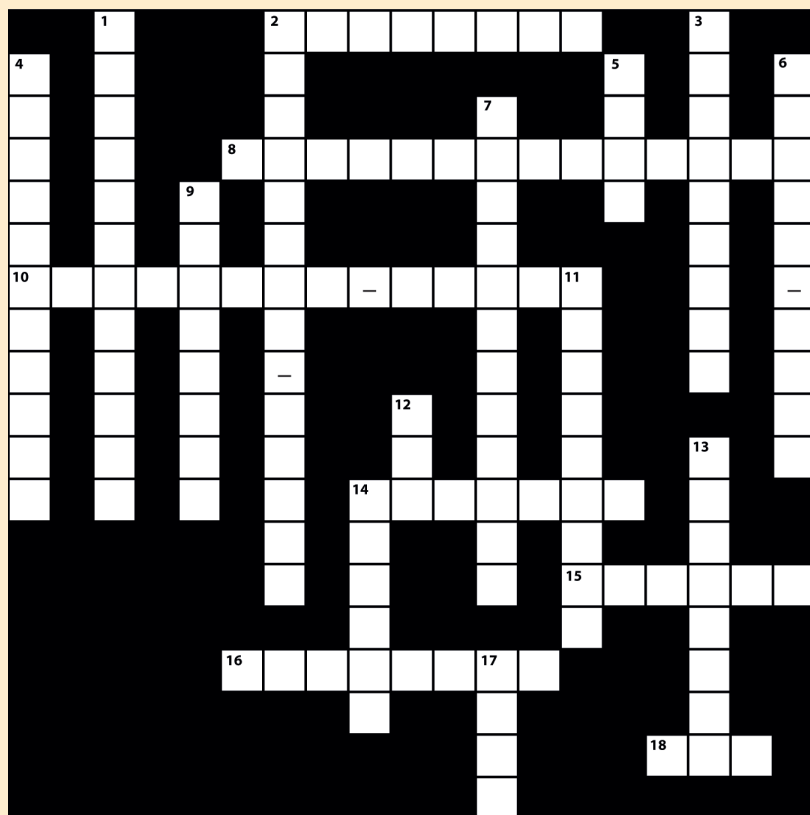




# Take the HVAC CHALLENGE™

BY STEVEN G. LIESCHEIDT, P.E., CSI-CCS, CCPR

## Supervisory Control Strategies and Optimization



### ACROSS

- This type of theoretical building would require no time for precooling or preheating and would have lower overall cooling or heating loads than an actual building.
- This type of combustion occurs when air and fuel could be mixed in the exact proportions indicated in the chemical reaction equation of a combustion process.
- Using this type of motor for chillers, fans, and pumps can significantly reduce energy costs, but they can also complicate the problem of determining optimal control.
- Achieving this level of supervisory control for thermal storage is a complex function of such factors as utility rates, load profile, chiller characteristics, storage characteristics, and weather.
- In a combustion process, this air is generally defined as air introduced above the stoichiometric or theoretical amount required for complete combustion of the fuel.
- This type of thermal storage ice tank has a more significant heat transfer penalty associated with recharging after a partial discharge because ice forms on the outside

of existing formations during charging.

- For a cooling tower operating at full load, this may be greater than or less than a value of one depending on if the tower is sized for optimal operation at design load conditions or oversized.

### DOWN

- Load and wetbulb temperature are examples of this type of variable.
- When using this type of cooling tower fan, the control sequencing activates the lowest-speed fan first when adding tower capacity.
- Optimal supervisory control of cooling equipment involves determining the control that minimizes this total cost.
- In an HVAC system, this upper-level control specifies setpoints and other time-dependent modes of operation.
- The number of this type of variable (independent) during optimization can be reduced significantly by using simplified supervisory control strategies and tools.
- In an HVAC system, this lower-level control

- of a single setpoint is provided by an actuator.
- The best strategy for a given chilled water setpoint is to reset this pressure relationship setpoint to maintain all discharge air temperatures with at least one control valve in a saturated (fully open) position.
- This term is often used to describe the cooling of storage in thermal storage systems.
- This type of control means that each pump cycles on and off with the chiller or boiler that it serves.
- This is defined as the ratio of system power consumption to total cooling load.
- This type of thermal storage ice tank typically has a small heat transfer penalty associated with restoring a partially discharged tank.
- This type of trim control system adjusts the airflow rate using an electromechanical actuator mounted on a boiler's forced-draft fan damper linkage and uses zirconium oxide mounted in the boiler stack.
- This organization publishes *Guideline for the Integration of Boilers and Automated Control Systems in Heating Applications*.

To brush up on the facts behind this month's clues, refer to Chapter 41 ("Supervisory Control Strategies and Optimization") in the *2003 ASHRAE Handbook — Applications*.



Liescheidt is owner of SPPEC-SS Consulting, LLC in St. Louis.

E-mail him at [sppccs@sbcglobal.net](mailto:sppccs@sbcglobal.net).

### Can't wait until next issue?

Then check out the answers for this month's "HVAC Challenge" online as well as past puzzles at [www.esmagazine.com](http://www.esmagazine.com).

### Solution to July's HVAC Challenge™

