Orange County, California
2019 – 2020

Orange Spiel

Juicy News from ASHRAE's Orange Empire Chapter

MEETING INFORMATION

TUESDAY, JANUARY 28, 2020

THE PHOENIX CLUB
1340 S. Sanderson Avenue
Anaheim, CA 92806

CLICK HERE FOR DIRECTIONS

Social / Registration . . 5:30 – 6:30 p.m.
Meeting Start/Dinner . 6:30 – 7:30 p.m.
Dinner Presentation. . . 7:30 – 8:30 p.m.

PLEASE E-MAIL (PREFERRED), OR CALL WITH YOUR RESERVATIONS TO:
Ryan Sibley c/o TK1SC
rsibley@tk1sc.com
Direct: 949.751.5923
Office: 949.751.5800

PRICE SCHEDULE

Member	$45
Non-Member	$50
Student	$10
Member Day of Event	$50
Non-Member Day of Event	$55
Vendor Table Tops	$150

CLICK HERE TO REGISTER ONLINE

IF CANCELLATION IS NOT RECEIVED YOU WILL BE BILLED FOR THE SESSION

DINNER PROGRAM
"Sustainable Refrigeration Systems: Trends and Practices" by Doug Scott, VaCom

NO TECHNICAL SESSION

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JANUARY JOINT MEETING NOTICE

TUESDAY, JANUARY 28, 2020

The ASHRAE Orange Empire and Tri-County Chapters would like to welcome you to join us for the January 2020 Joint Chapter meeting this January 28th. This month's meeting will be at The Phoenix Club. See below for details on the schedule and the presentation that you won't want to miss!

DINNER PROGRAM

SUSTAINABLE REFRIGERATION SYSTEMS: TRENDS AND PRACTICES

Refrigeration is employed throughout the global cold chain, from farm to home, as well as many other industrial and commercial applications. Increased competition and climate change are both driving important and necessary advancements in industrial and commercial refrigeration systems. The refrigeration cycle is also critically important in the decarbonization of buildings and industry when used for heating.

This presentation will describe challenges and opportunities for higher efficiency and reduced greenhouse gas emissions through improved design practice and low-GWP system technology, particularly using natural refrigerants.

REFRIGERATION IS A LOT LESS DANGEROUS TODAY... LEARN ABOUT NEW TRENDS AT THIS MONTH'S MEETING.

Doug Scott is President and Founder of VaCom Technologies, based in California, and now a BITZER Group Company. He has extensive experience in the industrial and commercial refrigeration industry, including development of efficient refrigeration technologies, industrial automation systems and real-time performance analytics. Doug is actively involved in ASHRAE, IIAR and other industry organizations.

Region X Chapters: Central Arizona, Golden Gate, Hawaii, No. Nevada, Orange Empire, Sacramento Valley, San Diego, San Joaquin, San Jose, Sierra Delta, So. California, So. Nevada, Tri-County, Tucson

DAVID'S BLOG

Happy New Year Orange Empire! It's crazy to think that 2019 has come and gone. We're only halfway through our 2019-2020 ASHRAE season, though, with a lot of cool stuff still to come. Last month's meeting was a huge success at the ERC in Downey. It's always a great time when we can gather with our friends from SoCal and Tri-County during the holiday season.

This month's meeting we're back at the Phoenix Club and will be joined by the Tri-County Chapter. If you haven't checked it out yet, you've been missing out and hopefully you can make it out for the first meeting of the New Year.

David Lawson

SHARE YOUR EXPERTISE!

Submit an article for publication in next month's Orange Spiel. Contact your editor today!

THE CONTROL LOOP

by Craig Hofferber

VAC system design requires a firm grasp of the mechanical engineering fundamentals of thermodynamics, psychrometrics, fan laws, others. The same can be said about controlling these mechanical systems. However, engineers are not normally taught control theory and its application to commercial buildings. Therefore, DDC control designs often lack the same engineering foundation as applied to the associated mechanical system designs.

Control loops form the foundation for continuous temperature control. Many control loops are required in a moderately-sized HVAC system. Three or more control loops exist in a single VAV terminal controller alone.

There are two types of control loops; open and closed. Open loop control bases its action on an input variable, but that action does not affect the input. Examples include space temperature controlling a heating water coil without sensing the discharge temperature after the coil. Open loops are important to temperature control but they should not be used when closed loop control can be established. For example, where the discharge temperature from the heating coil is controlled to a setpoint, which is then reset by deviations in space temperature; the desired control activity. Closed loops are the key element for stable and accurate temperature control (Figure 1).

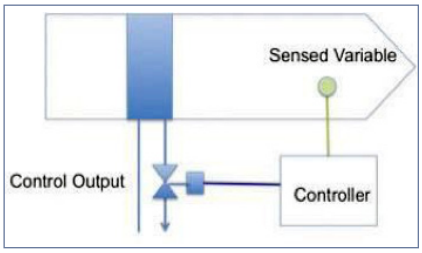


Figure 1 - Basic PID Control Loop

Closed loop control differs from open loop control because the input variable (sensed variable) provides immediate feedback to the controller. Sensors (e.g., temperature, pressure, humidity) provide the "sensed variable" value.

There are two types of control, depending on the device/equipment controlled; on/off and modulated. Modulated means proportioning (modulating) the equipment capacity to accurately meet the load setpoint demand on a continuous basis. On/off control is used when the controlled device/equipment capacity cannot be modulated (a (single speed fan, solenoid valve, heater/furnace). The control algorithm used is essentially a

*See **CONTROL LOOP** page 3)*

CONTROL LOOP

(continued from page 2)

mathematical version of an on/off thermostat based on fixed deviation from setpoint. On/off temperature control does not provide very accurate control, but it may be the only choice given the type or class of controlled device/equipment. Therefore, it still is an important ingredient to good temperature control. Modulating equipment capacity using proportional loop control is the preferred type of temperature control in a commercial building.

A proportional/integral/derivative "PID" control algorithm is typically used to implement closed loop control. In short, a PID algorithm (part of the controller program) compares the "Sensed Variable" to the setpoint and outputs a proportional value equal to the deviation from setpoint times its gain in the positive or negative direction. Based on the error between the "Sensed Variable" and setpoint, the PID algorithm continuously determines a "Control Output" value (typically 0-100%) which is then converted by the controller hardware to a 0-10 V DC or 4-20 mA DC output signal to proportion the equipment capacity with the goal of maintaining the "Sensed Variable" at the setpoint. This method is called proportional "P" control.

Proportional (P) control output by its programmed mathematical relationship, must see a deviation from setpoint to proportion the output signal in a positive or negative direction based on its programmed gain factor ("P") term. Proportional control loop action can be direct or reverse. Direct P action is best used for controlled variables that require an output signal that moves in the same direction as the input signal, such as cooling tower VFD fan control. A temperature rise causes the loop output signal to rise, increasing the fan speed and tower capacity to cool the condenser water. Reverse P control is where the output signal decreases as the sensed variable input increases. Reverse P control can be used for heating coil capacity control whereas the sensed variable increase, the control loop output signal decreases in proportion to its gain factor.

The "I" term stands for integral, which is a little more abstract in nature. P control by definition, leaves a deviation from setpoint once settled based on its gain factor, thus control at actual setpoint is close and stable, but not dead-nuts on setpoint. To simplify, the integral term signal rises in the positive or negative direction over time, opposite the deviation from setpoint; dropping to zero as the setpoint is reached. It has a speed (gain) factor based on how long a deviation from setpoint has occurred, adding a bias to the control loop output to trim the process to the actual setpoint value. The I action increases or decreases over time only when there is a P offset. This action is invaluable in maintaining accurate setpoint control of HVAC processes when applied properly.

The "D" term stands for derivative, which is even more abstract in nature. The D term provides a magnitude signal based on its gain factor as the slope of the sensed variable changes. It provides anticipatory feedback to alter the PI loop response to minimize the deviation from setpoint for fast changing processes such as steam convertors, where safeties can lift when temperatures deviate too far from setpoint on startup, or while the thermal load is light. HVAC control does not need a D term applied in most cases, but it is very handy for quickly stabilizing heat exchanger control when loads are light and the capacity available is plentiful.

PID control loops require careful tuning of the gain parameters to ensure that they can provide a control response that reaches setpoint in a reasonable time, and remains stable thereafter. These gain parameters determine how much affect a change in the error between the "Sensed Variable" and setpoint has on a change in the control loop output value.

If the gains are too sensitive, the loop will continuously cycle ("hunt") above and below setpoint. If not sensitive enough, then the loop will be slow to respond and may never reach setpoint. There are no universal "gains" that can be applied to every subset of HVAC applications. These values are chosen and initially tuned by control technicians with years of experience in handling process variables. Moreover, loop gain parameters must be tuned as the controlled equipment performance changes over time. Therefore, understanding and keeping PID loops properly tuned and functioning properly is one of the more challenging (and perhaps the most overlooked) aspects of operating/maintaining efficient control of HVAC processes. -END-

www.orangeempirearise.weebly.com

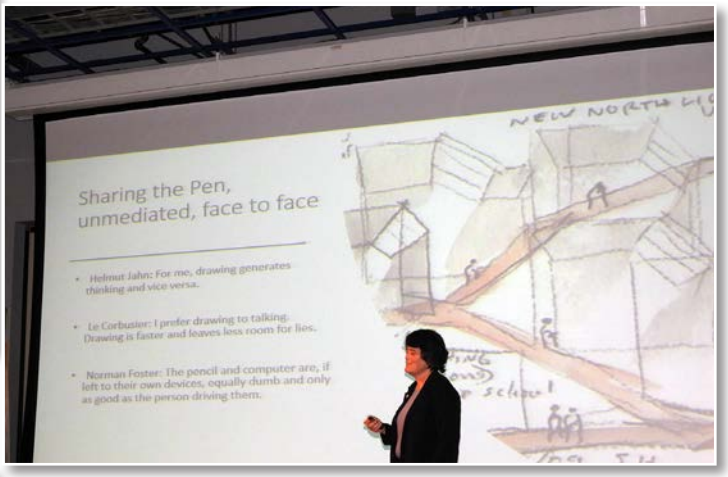
ASHRAE ORANGE EMPIRE CHAPTER

2019–2020 PARTIAL ROSTER

SPIEL DEADLINE
The February deadline for articles or ads is
FRIDAY, FEBRUARY 14, 2020

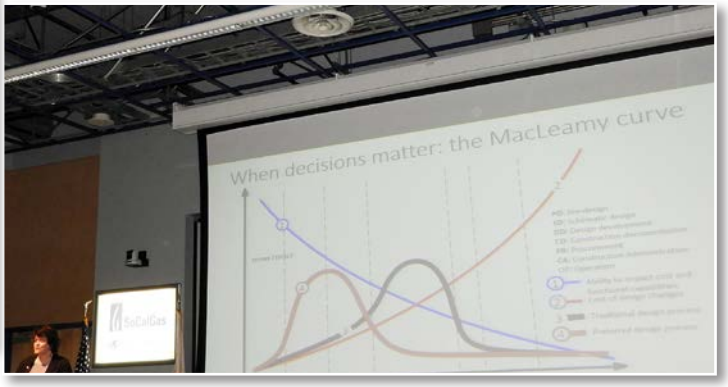
TUESDAY, DECEMBER 10, 2019 MEETING AT SO CAL ENERGY RESOURCE CENTER (ERC)

Presenter Erin McConahey



Discussing the importance of drawing and slowing down the old-school way

ASHRAE member Larry Sun asks a question



Presentation on holistic thinking discusses what should be understood about the design process.

ORANGE EMPIRE CHAPTER

WINTER/SPRING 2019/20 SCHEDULE

MEETING LOCATION:

THE PHOENIX CLUB
1340 S. Sanderson Avenue
Anaheim, CA 92806

TUESDAY, SEPTEMBER 24, 2019
Dinner: VRF and Hydronics Systems: A Strategic Comparison
Theme: Energy Night
Place: Phoenix Club, Anaheim

TUESDAY, OCTOBER 22, 2019
Tech: The Devil's in the Details - a CEU Presentation on what to Look out for when Installing Boiler and Water Heater
Dinner: Balanced Energy
Place: The Phoenix Club, Anaheim

TUESDAY, NOVEMBER 19, 2019
Tech: Driving to Net Zero: What Does it take for a Student Housing Project?
Dinner: 2019 California Code Updates from a Mechanical Perspective
Theme: Research Night
Place: Phoenix Club, Anaheim

TUESDAY, DECEMBER 10, 2019
Dinner: Holistic Thinking for Multidisciplinary Design Solutions
Theme: Joint Meeting with Tri-County Chapter
Place: So Cal Gas Energy Resource Center, Downy

TUESDAY, JANUARY 28, 2020
Dinner: Sustainable Refrigeration Systems: Trends and Practices
Theme: Joint Meeting with ASHRAE Tri-County Chapter – Refrigeration Night
Place: Phoenix Club, Anaheim

TUESDAY, FEBRUARY 25, 2020
Tech: Fault Detection and Diagnostics
Dinner: A Picture Stroll Through HVAC
Theme: Membership Promotion Night
Place: Phoenix Club, Anaheim

TUESDAY, MARCH 24, 2020
Dinner: TBD
Theme: Joint Meeting with San Diego Chapter
Place: TBD

TUESDAY, APRIL 28, 2020
Tech: TBD
Dinner: HVAC System Design
Theme: Student Night
Place: The Phoenix Club, Anaheim

MAY DATE TBD
Dinner: 2019-2020 Installation Night Dinner
Theme: Officer and Board Installation
Place: TBD

Orange Spiel

ASHRAE Orange Empire Chapter

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Orange Empire ASHRAE
2312 Park Avenue, #407
Tustin, CA 92782

MEETING SUMMARY

TUESDAY, JANUARY 28, 2020

DINNER PROGRAM

"Sustainable Refrigeration Systems: Trends and Practices" by Doug Scott, VaCom

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