

Sol Air

Newsletter of the Southern California Chapter: American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.
December 2005

Web site: www.ashrae-socal.org

Vol. 51, No. 4

JOINT MEETING: PAST PRESIDENTS' NIGHT DECEMBER 6, 2005 MEETING INFO

Southern California Gas - Energy Resource Center
9240 E. Firestone Blvd., Downey, California

6:00 Table Top Displays

7:00 Dinner

\$27 with reservation

\$32 without reservation

Meal will be a catered buffet – baked ham, oven roasted turkey and sides

Includes soft drinks and bottled water. Cash bar available.

8:00 Main Program: The History of Ventilation and Health

Speaker: Mr. Jan Sundell

9:00 Meeting Ends

Reservations: Michelle Sangalang, (626) 854-4613, m.sangalang@us-ac.com or Scott Gilchrist, (626) 854-4612, s.gilchrist@us-ac.com by Friday, Dec. 2, 2005.

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DECEMBER MAIN PROGRAM: THE HISTORY OF VENTILATION AND HEALTH

By: Darren Smith, P.E

For our dinner presentation this month, we have brought in an ASHRAE distinguished lecturer all the way from Denmark. Dr. Jan Sundell is an internationally recognized expert in the field of air quality and ventilation. He will be speaking on the

History of Ventilation and Health and the current state of the art.

Jan Sundell is an environmental scientist, originally from Sweden, with a unique background in both engineering (M.Sc.Eng) and medicine (Dr.Med.Sc.). Before going into science, he was responsible for building codes and occupational health legislation in Sweden and the Nordic countries. He was the main author of a model building code for ventilation in homes for the UN. He has conducted several large multi-disciplinary studies on associations between indoor environmental factors and health. His efforts have focused on ventilation, the causes of sick building syndrome, and for the increase in allergies/asthma. He has led numerous European multi-disciplinary reviews of the total scientific literature with regard to indoor climate and health. He has served on the Board of Directors of The International Society of Indoor Air Quality and Climate (ISIAQ), is Vice President of The International Academy of Indoor Air Sciences, and is the Editor-in-Chief of the most prestigious scientific journal within the field of "Indoor Air." Within ASHRAE he is a member of SSPC 62.1, the Environmental Health Committee, and is the chair of EHC Subcommittee for Research. He is an excellent provocative lecturer with outstanding knowledge on the need of ventilation, and the importance of indoor air factors for health.

Dr. Sundell has written or contributed to 8 books, 52 papers and over 200 articles.

Dr. Sundell will begin with an overview of ventilation over the last 200 years and will cover the changes in our industry that brought about the need for expanded focus on the indoor environment. He will also inform us why it has lagged the study and analysis that we have seen in outdoor air quality. Next he will bring us up to date on the state of the art and cover the sources of contaminants in addition to ventilation strategies. Dr. Sundell brings a broad perspective to the issue that I hope you will enjoy.

Lecture Topics:

- ❖ The History of Ventilation and Health: The historical discussion on ventilation and health will be presented, ending in the reasons for the standards of today, and a critical review of them.

(continued on page 2)



President
Chad Herrick



Chad's Chat

Happy Holidays! Welcome to December and the month that we hold the joint Chapter meeting with our sister chapters of Orange Empire and Tri-Counties. We are fortunate this year to have an ASHRAE Distinguished lecturer traveling from across the pond to speak about ventilation and its affect on occupant health. We have also designated this meeting as Past Presidents' Night. We will be taking the time to recognize the efforts and service of those who have been brave enough to take on what is a difficult but rewarding job. I look forward to seeing all of you that can attend and request that you make your reservations early.

Last month, I started a commentary to thank members of the board who have volunteered to serve the Chapter. This month I continue this effort and introduce two of the newest members of our Board.

Carmen Urenda has been actively involved for the past several years as the Research Promotion Chair and has done a great job raising needed funds for ASHRAE Research. This year Carmen has taken a position as Director on the Board and has been overseeing the efforts of Research Promotion, the *Sol*Air* Newsletter, and the upcoming Spring Seminar which is tentatively scheduled for next April or May.

Russ Lieu has taken on a Directors position on the board with oversight on TEGA and our Refrigeration Committee. This is a daunting challenge since our Refrigeration Committee has been dormant for the past several years, but I am confident that Russ is the man to revive it from its slumber.

Finally, on a somber note, I must recognize the passing of a longtime Chapter member and supporter, Lou Horsefield. Lou -- otherwise known as the "Senior Student" -- has been a fixture in our industry forever. I personally only had a few opportunities to work with Lou, but his contribution to our industry is unquestioned and he will be greatly missed. Look for an historical article on Lou's career in the January issue of *Sol*Air*.

I wish all of you and your family a joyous, happy and healthy Holiday Season and look forward to seeing you at the Joint Chapter Meeting.

December Main Meeting Program

(continued from page 1)

- ❖ Ventilation and Health: This talk gives an overview of the state of the art regarding the importance of ventilation for health. Do we really need ventilation and how much from a health point of view?
- ❖ Dampness in Buildings and Health: "Toxic" mold is a popular issue in the United States. But what do we know? Are we getting sick from exposure to mold? In this talk, the state of the art regarding the scientific knowledge will be addressed. New results from ongoing studies in Europe will be presented. Is mold that important?
- ❖ Indoor Air Quality and Health: This talk presents an overview of most aspects IAQ and Health. What exposures are important from a health perspective?

Indoor Air Humidity, Health and Comfort: Is air humidity of importance for health or comfort? The state of the art of knowledge is presented. Other specific topics related to indoor air and health can be addressed in specially designed lectures. A discussion beforehand is then needed.

NOVEMBER MAIN MEETING RECAP

By David Kuo, P.E.

Gail Stranske from CTG Energetics gave an excellent presentation on the new 2005 Title 24 Standards focusing on mechanical requirements. She discussed both mandatory prescriptive changes as well as performance approach changes. The major prescriptive changes are highlighted below:

- ❖ Demand Control Ventilation is required in spaces with occupant density ≤ 40 square feet per person
- ❖ Variable Speed Controls required on VAV fan systems > 10 bhp and variable flow pump systems > 5 bhp
- ❖ Central cooling plants greater than 300 tons require water-cooled chillers
- ❖ Open cooling towers with capacity > 900 gpm may not use centrifugal fans
- ❖ Temperature reset controls for chilled and hot water systems $> 500,000$ Btuh
- ❖ Electrically commutated motors for series fan-powered terminal units

Of course tradeoffs between measures are still allowed when demonstrating compliance via the Performance approach. The new Time Dependent Valuation (TDV) methodology of this approach favors

measures that save energy during on-peak electrical periods.

Lastly, perhaps the largest single change in the new standard is the mandatory requirement for Acceptance testing. Acceptance testing entails verification of system performance similar to commissioning. Testing must be witnessed by a professional – installing contractor, engineer of record, or owner’s agent. The witnessing party has to sign a new Certificate of Acceptance (form MECH-1-A) that becomes part of Title 24 documentation.



David Kuo presents Gail Stranske with a certificate of appreciation.



OIL-LESS SYSTEM DESIGN

By Doug Sallade

The advent of oil-less air conditioning systems will allow us to look at system design with a wholly different, less-complicated approach. What we are speaking about is compressors (and therefore systems) that do not require oil lubrication. In my previous article, I discussed technologies that allow compressors to operate without lubrication. This month we will carry that discussion forward to the changes oil-less technology has on overall system design.

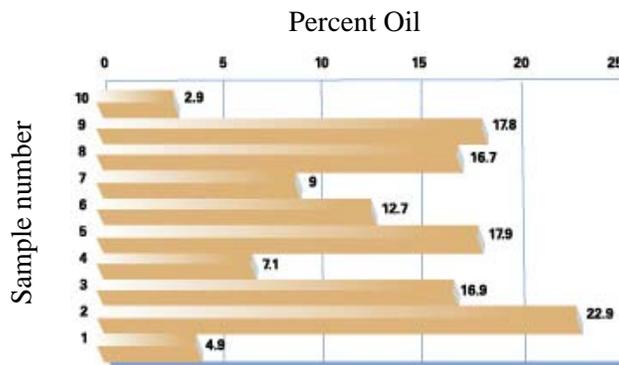
One of the problems with oil is that it doesn’t stay in the compressor. Aside from the challenges that we face in getting that oil back to the compressor, (which we will discuss in a moment) we have had to suffer the efficiency loss resulting from the oil circulating throughout the system. This efficiency loss is a result of oil coating the tubes, thereby decreasing heat transfer in the condenser and evaporator. ASHRAE data indicates that having too much oil in a system does indeed reduce system efficiency.

So simply getting the oil out will improve overall system efficiency!

Without having to worry about oil, what other system changes (improvements) can be made?

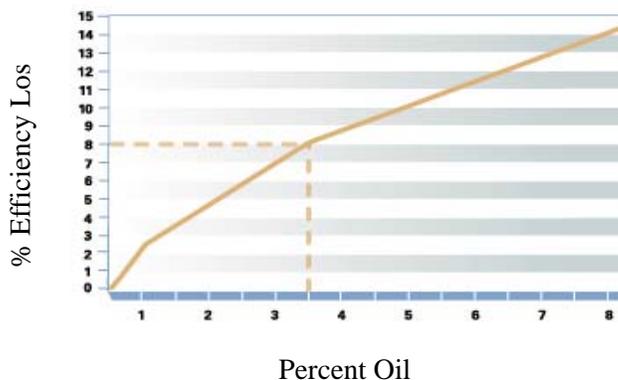
What about line sizing?

As we have all learned, line sizing is a sometimes frustrating balance between pressure drop and velocity. Minimizing pressure drop at the same time maintains a minimum refrigerant velocity to return oil to the compressor. With an oil-less system, velocity concerns go away. Piping can be sized to truly minimize pressure drop (the price of upsizing the pipe is the real limitation).



An ASHRAE study determined that the vast majority of installed chillers have an excess amount of oil in the cooling system

ASHRAE research study 601



3 ½ % of oil in the refrigerant charge reduces system efficiencies by 8 %

How about line sizing for part load operation?

Another large component of the velocity issue is, how to return oil to compressor in part load operation, when refrigerant velocities are low. Typically, this “problem” is solved by using reduced suction risers, double suction risers, P-traps, etc. Oil-less system design does away with this costly piping complexity.

Does an existing system, that is retrofitted to oil-less operation, need to have P-traps, double suction risers, and the like, replaced?

No, If an excessive pressure drop problem exists, you would probably want to upgrade the piping, otherwise, use what is there.

Evaporator staging on large DX air systems?

On reciprocating compressors that use cylinder unloading for capacity control, solenoid valves are installed on the liquid lines to stage the evaporator capacity to match compressor capacity. This is an effort to keep the refrigerant velocity high enough to return the oil to the compressor. This approach sacrifices efficiency in low load situations, because we don't utilize all of the evaporator surface area.

In an oil-less system (retrofitted or new installation), the approach would be to open all the solenoids liquid line on system start-up, allow the electronic expansion valves to control flow, and since we are not worried about refrigerant velocities, let the variable frequency drive on the compressor control system capacity. EXV control is obviously very important to avoid liquid slugging.

Don't the solenoid valves, EXV's, etc., need oil for lubrication?

No. Many systems are operating today in a totally oil-less system (systems that are new from the OEM, not just retrofits). These systems have performed without any problems with the valves.

An oil-less air conditioning/refrigeration system offers some exciting opportunities to truly exploit the energy saving capability of any system (new or retrofit). It is an emerging sector of our industry that really just beginning to be utilized. I can't wait to see the exciting applications and transformations that will occur.



Job Posting available on our Website!!!

Working late at night, don't have time for lunch, cut off all day in meetings...you must need help?

Don't miss the opportunity to publish your job posting in our website under the job shop tab:

<http://www.ashrae-socal.org/jobShop.asp>

Please contact Karine Leblanc for any details
karine@rezine.net



APPLYING OIL INDUSTRY VALVE TECHNOLOGY TO HVAC

By George Orff

A truly pressure independent 2-way modulating flow control valve has been developed for the HVAC industry. The valve is the product of development of a pressure independent modulating 2-way valve used to inject solvents in oil and gas wells. Oil industry requirements run from one pint per day to 20 GPM at 15,000 PSI pressure differential.

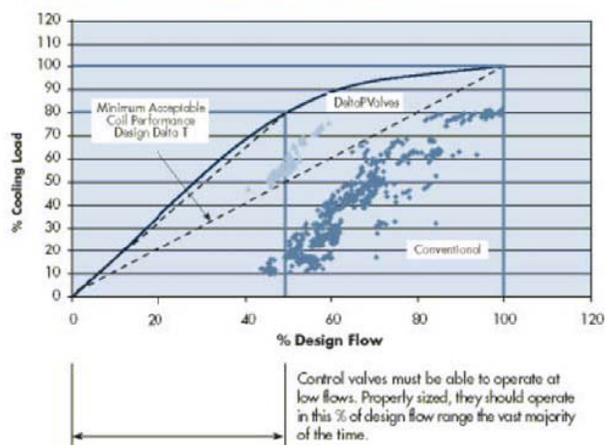
As a result, Flow Control Industries developed the Delta-P brand, fully pressure independent, modulating flow control valve for HVAC. This is not to be confused with a 2-way pressure dependent valve which uses a circuit setter to limit maximum GPM through pressure dependent valve. The Delta-P valve is pressure independent at any stem position, flow and pressure differential.

The Delta-P valve is fully pressured independent throughout its GPM range. Each valve comes with a flow tag attached which provides GPM as a function of shaft position. The valve is so accurate that it can be used as a flow meter.

Why a 2-way, pressure-independent modulating flow control valve? A coil capacity chart, Table 1, reveals at 80% load, a coil requires 50% of design GPM. In a system with a 2-way pressure dependent valve as the system cuts back, the pump generates more head which forces more water through the valve, over pumping the coil and all related systems which are not at design. Using a pressure independent valve, the valve kills the extra pressure such that at 50% load, you only use 50% GPM. Remember, the system horsepower drops as the square of the GPM and the horsepower drops as the cube of the GPM. So, if a system is operating at 50% GPM, the system pressure drops to 25% of design and 12½% horsepower.

When the 2-way pressure independent valve is used with a VFD and a pressure sensor at the most remote coil controlling the drive speed, the horsepower savings are significant.

ARI Cooling Coil Performance Curve 1/2 Flow Addresses 80% of the Load



The valve has multiple new and retrofit uses:

- ❖ Use the valve as a problem solver where you are “running out of water.” In a recent installation, Delta-P Valves were placed on air handlers close to the chilled water pumps. As they prevented over pumping of those units, additional water was available at the roof of the building to help solve a low flow problem.
- ❖ Use on buildings with a large heating or cooling distribution system to increase part load ΔT .
- ❖ Typically you can achieve a ΔT which is 25% higher than your normal design ΔT . Thus, if your full load ΔT is 10°, your part load ΔT can be 12°-13°.
- ❖ Use on small chiller systems with constant or variable speed pumps.
- ❖ Use the valve on large chiller central plants with primary/secondary flow. The valves can be used to starve the transport loop and drive the ΔT up and the pumping costs down.
- ❖ Use for variable primary flow chiller plants. Valves can be used at the coils and in a bypass in parallel with the chiller, achieving high ΔT 's and proper minimum flows through the chiller.

An excellent system design manual for use in applying pressure independent 2-way flow control valves is available through Flow Control Industries or DMG. Flow Control Industries also has available a “quick savings estimate” calculator for use in estimating savings in applying the valve.

Lastly, there are times when installation of these valves can avoid addition of another chiller.

This is because, in systems without these valves, even at design, not all systems are at design GPM. By application of pressure independent valves, you can

pick-up this diversity by forcing all loads, not at design, to operate at higher ΔT 's with the result that this water is not bypassed but becomes available for other loads.

Conclusion: The pressure independent, 2-way modulating flow control valve is an idea whose time has come. For years, we have used its equivalent in VAV boxes on variable air volume systems. It is now time to adopt the same practice in HVAC hydronic systems.

USER'S MANUAL PROVIDES BETTER UNDERSTANDING OF ASHRAE 62.1

Submitted by Jodi Dunlop

A new user's manual provides a better understanding of the design, installation and operation requirements in ASHRAE's ventilation standard.

The Standard 62.1 User's Manual explains the requirements of ANSI/ASHRAE Standard 62.1-2004 – Ventilation for Acceptable Indoor Air Quality – and contains numerous examples of their application in an easy-to-follow question and answer format.

“Because the standard is written in code-intended language, such material could not be included in the standard itself, so the manual helps users better understand the intent and apply it to their work,” Dennis Stanke, chair of the Standard 62.1 committee, said. “It helps users understand what Standard 62.1 requires and how those requirements can be met. It's a document that designers have needed for many years and will find useful for many years to come.”

The manual includes a CD containing a spreadsheet to assist in the standard's new ventilation rate procedure calculations.

The manual was developed through ASHRAE research and partially funded by the National Institute of Standards and Technology, the Air-Conditioning and Refrigeration Institute and the U.S. Green Building Council.

The cost of the Standard 62.1 User's Manual is \$55. (\$44 for ASHRAE members).

To order, contact ASHRAE Customer Service at 1-800-527-4723 (United States and Canada) or 404-636-8400 (worldwide), fax 404-321-5478, by mail at 1791 Tullie Circle NE, Atlanta, GA 30329, or visit the ASHRAE.org Bookstore at www.ashrae.org.

ASHRAE, founded in 1894, is an international organization of 55,000 persons. Its sole objective is to advance through research, standards writing, publishing and continuing education the arts and sciences of heating, ventilation, air conditioning and refrigeration to serve the evolving needs of the public.



"ENGINEERS MAKE A WORLD OF DIFFERENCE!!!"

**NATIONAL ENGINEERS WEEK
E-WEEK
Feb 19-25th, 2006**

YOU ARE INVITED TO E-WEEK 2006!!!

For the 4th consecutive year, we would like to invite the students with their teachers to participate in one or both activities listed below.

This is a great opportunity for the students to learn about science, engineering and experience real life applications.

Thursday Feb 23rd

Visit **Southern California Edison** in Irwindale

Tour of Customer Technology Application Center (CTAC) and a look at the Electric Vehicle

Speakers talking about their Career Path and showing of the ASHRAE Video

Schedule: 9:00am – 12:00am. Lunch provided

The CTAC is an Energy Center operated by Southern California Edison. It is a facility dedicated to providing information about energy management and efficiency.

Friday Feb 24th

Visit **Southern California Gas Company** in Downey

Tour of Energy Resource Center (ERC) and Combustion Class with explosions

Speakers talking about their Career Path and showing of the ASHRAE Video

Schedule 9:00am – 12:00am. Lunch provided

The ERC is an Energy Center operated by Southern California Gas Company. It is a facility dedicated to demonstrating energy-efficient and environmentally friendly technologies.

Please call or e-mail Karine Leblanc to sign up for additional information

Phone: 626-854-4611

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SOUTHERN CALIFORNIA CHAPTER PROGRAM SCHEDULE

January 10, 2006: Research Night

Tech Program: Principles of Engineering Economics/
System Feasibility / LCC Analysis
Speaker: Ed Clancy, Cal Poly Pomona
Main Program: Tour of UCLA Cogeneration Facility
Speaker: Lucas Hyman, Goss Engineering
Location: UCLA

February 7, 2006: Membership Night

Tech Program: Good-Bye Division 15: The New &
Improved CSI Specification Format
Speaker: Michael Chusid, Chusid Associates
Main Program: Value Engineering, Cost Estimating -
Owners Perspective
Speaker: Timothy Ball, CSU Long Beach
Location: Les Freres TAIX

March 7, 2006: QC Night

Tech Program: Commissioning Process. Developing Cx Plan
 Speaker: David Ellner, TRC-EASI
 Main Program: Tools, Implementation Strategies, Primary Variable Flow Case Study
 Speakers: Scott Duncan, Retrofit Originality Inc. and Craig Hofferber, H&P
 Location: Les Freres TAIX

April 4, 2006: Refrigeration Night

Tech Program: Tour of Miller Brewing Company plant in Irwindale with a focus on refrigeration system
 Speaker: Allan Spear
 Main Program: Energy Efficiency Update & Electricity Supply Demand Outlook
 Speakers: Gary Green, SCE
 David Bruder, SCE
 Location: SCE CTAC in Irwindale. Tour scheduled for 4:30 pm to 6:00 pm

May 2, 2006: Student Night

Tech Program: Showcase of successful Savings By Design energy efficient projects - local mechanical engineers panel
 Speakers: Janith Johnson, SCE
 Peter Simmonds, IBE Engineers
 Eric Shamp, HMC Group
 Main Program: Student Senior Project Poster Board Session and Presentation
 Speakers: Jesse Maddren (Cal Poly SLO) and Students
 Location: Les Freres TAIX

June 2006

Installation Dinner/Dance

HELP WANTED

If you are interested in placing an ad in this column for an engineering or other position, please submit your request to:

SHARON McKEOWN & SUSAN WELLS

Western Allied Corporation

12046 E. Florence Ave., Santa Fe Springs, CA 90670

(562) 944-6341 / fax (562) 944-7092

e-mail: smckeown@wasocal.com / swells@wasocal.com

Please make a donation of \$50 per ad made payable to: ASHRAE Southern California Chapter.

Mechanical Engineer

If you are looking for leadership opportunities in mechanical engineering and design - please contact us! Coffman Engineers is a leader in mechanical design, with projects throughout the western United States. Our Los Angeles area office is looking for individuals with the ability to help us expand our market in the Southern California area and internationally.

The successful candidate will have four to six years of experience designing HVAC, piping, and plumbing systems for health care, institutional and commercial facilities. A B.S. degree in engineering or a related field is required; P.E. registration is preferred. Additional requirements include outstanding leadership, supervisory and communication skills; experience consulting with architectural firms; and proven expertise in putting projects together independently.

Coffman Engineers was founded 25 years ago and is a leading engineering firm providing structural, mechanical, electrical, civil, and corrosion services for a diverse client base. This position offers extraordinary advancement potential for motivated individuals interested in working for a multi-office design firm.

Please submit your resume and application to lahrd@coffman.com, fax to 818-285-2651, or mail to: Coffman Engineers, Attention: Human Resources, 16133 Ventura Blvd., Suite 1160 Encino, CA 91436 Position No. 236ME-4.

We are proud to be an equal opportunity employer.

Entry to Mid-level Engineering Positions at kW Engineering

kW Engineering, Inc. is seeking entry to mid-level energy engineers to join our team in Oakland and Long Beach. We are looking for self-motivated people willing to accept responsibilities for a wide range of projects including project management responsibilities. Learn from an experienced staff committed to saving energy in buildings and industrial processes. We offer flexible work hours, hands-on experience, and a creative, casual work environment. Excellent opportunity to obtain PE certification. Experience with DOE-2 and utility energy efficiency program support is a plus. Reply with résumé to hr@kw-engineering.com. Alternatively, submit hard copy response to:

kW Engineering, Inc.
 Attn: Human Resources
 360 17th Street, Suite 100
 Oakland, CA 94612

Director of Engineering

San Diego-based Mechanical Engineering firm specializing in HVAC, Plumbing and Cogeneration, is searching for an experienced Professional Engineer to lead the Engineering Department.

This position will oversee and manage the flow of work generated by the Team Leaders, Project Managers, Project Engineers and Designers from project inception to its final completion, with emphasis on maintaining a high quality product while providing superior client satisfaction.

RESPONSIBILITIES

The Director of Engineering's responsibilities will include but not be limited to the following areas:

- ❖ The establishment and implementation of Standard Engineering Practices to include the engineering and quality assurance process and procedures.
- ❖ Oversee the updating of the current design standards and CAD standards and develop ongoing maintenance policies and procedures for each.
- ❖ Assign, coordinate and schedule all incoming projects, to the team that is best suited for each project, considering project scope, deadlines/due dates, project intensity and type.
- ❖ All aspects of project management and design efforts on projects that are personally engineered and designed by himself/herself.
- ❖ Performance and salary reviews of Team Leaders. Review and make recommendations on performance and salary reviews prepared by Team leaders for their respective Project Managers, Project Engineers and Designers.
- ❖ Assistance with proposal preparation, coordination and review with Director of Sales and Marketing.
- ❖ Perform project quality assurance reviews on projects prior to construction.
- ❖ Direct interview selection process in hiring of new Project Managers, Designers, Project Engineers and Interns.

Additional attributes sought will include strong writing skills, with the capability to produce significant reports and studies, perform data analyses, and communicate effectively with clients, equipment vendors, construction contractors, etc.

Individual must have a minimum of 15 years experience, be detail oriented and possess the ability to see projects through to completion. Salary and benefits are commensurate with experience. Location of work is primarily in San Diego, CA. Please forward resume and

salary history to H/R Department Walsh Engineers 5471 Kearny Villa Road Suite 300, San Diego, CA 92123, or e-mail using MS Word format to rivko@walshengineers.com.

Licensed Mechanical Engineer

San Diego-based Mechanical Engineering firm specializing in HVAC, Plumbing and Cogeneration, is searching for a PE experienced in the following disciplines, for expansion of its Power Generation and Cogeneration division. Individual must have a minimum of 10 years experience, be detail oriented and possess the ability to see projects through to completion.

- ❖ Proven Capabilities in the Production of Plans & Specifications for plants in the range of 1 – 30 MW;
- ❖ Process Design: Steam & HTW, fuel supply systems, chilled water and cooling water systems;
- ❖ Piping Design: Sizing, support, flexibility and stress analysis;
- ❖ Prime Mover & Heat Recovery Equipment Selection;
- ❖ Plant General Arrangement;
- ❖ Economic Modeling; Feasibility and Optimization Studies;
- ❖ Instrumentation & Controls: Control valve & actuation selection, instrumentation selection and specification; development of written sequences of operation;
- ❖ Ancillary Systems Design and Equipment Selection;
- ❖ Start-Up, Commissioning and Troubleshooting Activities.

Additional attributes sought include strong writing skills, with the capability to produce significant reports and studies, perform data analyses, and communicate effectively with equipment vendors, construction contractors, etc. The candidate must have the ability to conceptualize and create small to medium-sized generation plants, including equipment arrangements, piping runs, P&ID's, etc., while working in conjunction with equipment vendors, end users and construction contractors.

Narrative describing typical activities:

Typically, this senior-level mechanical engineer would have some involvement with, perhaps, three projects simultaneously: One in design, one in construction and one in start-up/commissioning.

At least 60-70% of the engineer's time would be focused on design tasks: Developing general arrangement plans, process design, equipment selection, piping design, I&C, detailed piping drawings, etc. He

would be supported by other (junior) engineers, designers and CAD drafters from an existing pool of personnel. Projects which are in construction will generally require engineering support from this individual. This may include site visits, construction meeting, formally responding to field questions which may arise, quickly developing "work-arounds" or design modifications to suit field conditions, etc. The above activities may comprise 20-30% of the engineer's time. Start-up and commissioning activities may involve approximately 10% of the engineer's time. This effort may be comprised of field supervision, developing testing sequences, check lists, documentation packages and working closely with the commissioning staff, vendor representatives and operators during the start-up phase. The projects are generally located in Southern California, resulting in mostly day-trips, with an occasional extended stay of 2-3 days.

Most of the engineer's work is related to design tasks. The results of this work effort are plans (drawing packages), specifications and procurement packages related to a specific project. To ultimately produce final construction drawings, the engineer will start with thermal analysis, process design, equipment selection,

etc., and then generate detailed sketches or preliminary drawings. These, in turn, are given to designers and CAD drafters who will further their development towards construction drawings. However, the engineer will be responsible for reviewing, correcting, amending, and approving the drawings until the construction set is complete. During this process, he will be communicating and coordinating his design with other engineering disciplines (electrical, structural, etc.) and equipment vendors to insure the final drawing package is complete and constructible. In this regard, the ability of communicate effectively with design and

CAD staff, as well as peers in other disciplines is vitally important.

Salary and benefits are commensurate with experience. Location of work is in San Diego, CA. Please forward resume and salary history to H/R Department Walsh Engineers 5471 Kearny Villa Road Suite 300, San Diego, CA 92123, or e-mail using MS Word format to rivko@walshengineers.com.



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