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General Information about the Training

ASW Engineering offers training courses on many different topics and most courses can be customized to fit specific training requirements for a wide variety of audiences. For example, many of the courses can be configured with differing levels of depth into the topics—from a half-day course to two full days, as required by the audience receiving the training.

For in-house training, we can offer a variety of testing options that can be customized to fit specific needs.

- Pre-test and post-test to measure participant “learning”
- Final tests for individual courses
- Final tests for multiple course curriculum
- Imbedded “check your understanding” open book quizzes

For more information on any of the courses or testing options, contact David Wylie.

Core Technology for Building Operations

[C1] Energy Efficient Lighting Systems

In many older facilities, existing lighting systems often were not designed with energy conservation in mind and don't meet the lighting requirements of the tasks performed at the facility. Lighting systems often provide energy conservation opportunities that can mean significant cost savings. The goal of this course is to help identify and weigh options for more effective and energy efficient lighting solutions.

This course begins with lighting concepts and terms that relate to understanding how to improve lighting efficiency with maintenance, lighting levels, de-lamping, daylighting, and control strategies. It also presents an overview of new lighting technology and types of lamps, including four generations of T-8 fluorescent lamps, T-5 lamps, induction, high intensity discharge lamps, LEDs and more.

[C2] Electric Motors and Adjustable Speed Drives

Electric motors play an important role in the operations of most commercial and industrial facilities. Premium efficiency motors and adjustable speed drives often can improve the efficiency of motor-driven systems and can reduce energy costs. The goal of this course is to present useful information about how to manage your motors, and how to keep your motors and business operating smoothly. It explores electric motors and systems and demonstrates where and how you might implement energy efficient motors in your facility.

This course begins with electric motor terms and nameplate data, discusses loads and load matching, losses and efficiency. It describes what makes motors efficient and new standards to rate them. Discover how adjustable speed drives are applied and how they can provide more efficient and effective use of electric power, which lowers energy costs, extends equipment life, and reduces overall maintenance costs. This course covers several common HVAC applications for adjustable speed drives, and explores where, when, and why their use in building systems is practical and financially viable.

Alternative version: **Motors – To Repair or Replace, That is the Question**

At what point is it more cost-effective to replace an electric motor rather than rewind it? The standards approved under the Energy Policy Act of 1992 increased the minimum motor efficiency requirements for “premium efficiency” motors. In this session, these new requirements and the costs of “premium efficiency” motors are compared with the associated costs of rewinding a motor. Also, this presentation covers criteria for efficiently replacing and rewinding motors.

[C3] Package Unit Air Conditioning (Basic HVAC)

This course presents the fundamentals of air-conditioning systems found in residential and small-to-medium commercial and industrial facilities. Some previous AC system experience is helpful, but this workshop covers the basics. This course introduces package unit system components, controls, and applications and presents energy efficiency maintenance and operations concepts, and how package unit efficiency has improved dramatically over recent years. Using audit worksheets in an in-class exercise, we explore package unit replacement economics.

Alternative version: **Basic Heating, Ventilation, and Air Conditioning (HVAC)**

This half-day class introduces the basics of HVAC systems found in residential and small-to-medium commercial and industrial facilities. This session is designed for participants with little or no previous familiarity with HVAC systems.

[C4] Air Handling Systems

The air handling components of central facility air conditioning systems are essential for providing comfort to occupants of commercial facilities. This course, in conjunction with the “Chilled Water Systems” course, provides a foundation for understanding air conditioning systems and discusses how to minimize the cost of your commercial facility’s central air conditioning system.

This course describes a variety of air-handling systems used in commercial and industrial applications and introduces typical air system components, constant and variable air volume systems, variable air volume flow control, adjustable speed drives, ventilation, economy cycle, and other energy conservation opportunities. This course includes an in-class exercise that demonstrates a model for analyzing typical variable air volume retrofit economics.

[C5] Chilled Water Systems

Chilled water systems are used to provide air conditioning comfort to the occupants of commercial buildings and industrial facilities and to support industrial processes. Chilled water systems often account for a major portion of the overall energy consumed. New technologies can be applied to reduce this cost by more than half.

Along with the “Air Handling Systems” course, this one-day seminar provides insight into these issues and provides a foundation for understanding central plant air conditioning systems. This course emphasizes strategies for owning and operating an energy efficient system, and explores the components of typical systems, controls and operating concepts, and water conservation issues and opportunities. This class discusses chiller machinery, refrigerant options, the impact of cooling towers, using variable speed on compressors, and variable chilled water flow. It includes a case study that goes through the process of selecting an energy efficient chiller.

Alternative version: **Choosing High-Efficiency Chillers**

When choosing a new chiller, there are dozens—if not hundreds—of factors that affect efficiency. Choosing a new chilled water system can be challenging—it requires considerations for energy efficiency, refrigerant selection, drive train, system configuration, and more.

This presentation covers basic chiller types, and the incremental costs and savings of upgrading from standard chillers to the most efficient.

Alternative version: **Comparing Air & Water-Cooled Chillers**

Chilled water systems are used to provide air conditioning for commercial buildings and industrial facilities and to support industrial processes. This class presents an overview of chiller systems including basic components and operations, sizing air-conditioning loads, air-conditioning system concepts, common system configurations, measuring chiller efficiency, improving chiller efficiency, AC cost and efficiency considerations, compressors, condensers, cooling towers, and water treatment options. This class compares air-cooled and water-cooled chiller systems and discusses the pros and cons for each type of system.

Alternative version: **Comparing Electric & Gas Chillers**

This course provides information that will assist commercial building customers with the selection of water chillers, in the range of 100 to 2000 tons of cooling. This course address the selection of chillers with either gas or electric prime movers. Electric systems frequently compete with natural-gas driven technologies, and competitive issues are presented. Major course topics include market breakdown of installed chiller base and recent sales trends, technology descriptions for both electric and gas chillers, manufacturers and product offerings, selection and optimization criteria, chiller economics.

[C6] Owning & Operating an Efficient Cooling Tower

For many large commercial and industrial air conditioning and refrigeration systems, heat is rejected using cooling towers and evaporative condensers. This one-day seminar examines the trade-off between cooling tower size and energy savings. It will address several cooling tower efficiency measures and other relevant issues including cooling tower sizing, approach control strategies (efficient fan operation), water treatment (including ozone), and water conservation. This course also includes several local case studies.

As a separate course: **Ozonation for Cooling Towers**

Ozonation is an economically viable and environmentally attractive alternative for cooling tower water treatment in many installations. This course briefly reviews basic cooling operations and conventional water treatment options and explores the considerations associated with ozone water treatment. Additional course topics include energy and water savings, regulations, financial analysis, and case studies.

As a separate course: **Conductivity Controllers for Cooling Towers**

This course explores systems that can benefit from conductivity controllers, and explains how they are used. This course also addresses heat gain, types of chiller systems, cooling tower operations and design, need for cooling tower water treatment, and automatic cooling tower control systems for water treatment, and conductivity controllers.

[C7] Energy Efficient Boiler Operations

With the high cost of natural gas, it is now more important than ever to operate boilers and water heaters efficiently. This course presents issues relative to owning and operating efficient boilers and water heaters of all sizes. It discusses the importance of the purchase decision for new boilers and water heaters, design factors that affect system efficiency, the cost effectiveness of implementing and practicing efficient operations, and the importance of proper system maintenance. In addition, this course provides some common-sense suggestions for making operations more energy efficient including strategies for boiler combustion efficiency and control, minimizing boiler blowdown, and the efficient operation of ancillary devices.

[C8] Energy Management Systems

Alternative title: **Energy Management Systems: How They Work, Strategies for Energy Savings, Planning for Implementation**

Facility control systems can range in size from relatively simple local controls for a single piece of equipment to complex, integrated networks designed to coordinate, manage, and control all of the primary energy-using systems in multiple buildings.

This one-day seminar presents a review of common HVAC system configurations, the fundamentals of how energy management systems (EMS) are constructed and how they work, an overview of communication networks, and how EMS are able to maximize energy-use savings. It focuses on how to maximize savings using the most current technology in HVAC control methods.

In addition, this seminar presents a practical, systematic approach for identifying, designing, and planning the implementation of an energy management control system. Additional topics include conducting equipment studies and cost/benefit analysis. This seminar is recommended for those who have some understanding of HVAC systems and desire to know more about saving on operating costs with an EMS.

Courses in Energy Management and Analysis

[M1] How to Manage your Business's Energy Costs

This class is designed for owners of small and medium-sized businesses and non-technical personnel who want to learn ways to reduce energy costs at their place of business. Participants will receive practical information on how to conduct an energy-use survey and information about their lighting and air-conditioning systems. The class also presents useful energy conservation information on utility bills and rate schedules, and includes a work plan to implement survey recommendations.

[M2] Energy Efficiency Survey

This two-day course presents a comprehensive overview of many topics related to the energy efficiency of most commercial facilities. Topics include energy efficiency and important terms, lighting, motors, air conditioning systems, boilers, refrigeration, the energy audit, and work plan.

[M3] Implementing Energy Efficiency Projects: From Concept to Contractor

You may suspect that the old equipment in your facility is using too much energy, and perhaps new equipment is worth the investment. On the other hand, why make a change when the old equipment is still running... kinda. So, how do you know what to do?

This workshop will present several options that are available to help you survey and assess your current situation and to develop a plan for implementing energy efficiency projects. These activities represent different ways to assess a project, from the simple and high-level to more complex and detailed studies. These options also can be implemented to help you weigh your choices, determine an appropriate, economically viable direction to take, and after implementation, measure the savings. They include:

- Screening audit
- Preliminary energy assessment
- Feasibility study
- Design-build criteria
- Startup and commissioning

This workshop will present examples of each of these tasks and will discuss ways to justify the investment involved.

[M4] HVAC System Testing for Energy Efficiency

Alternative title: **HVAC System Testing for Energy Efficiency, Measurement and Verification**

Today's technology has made available many portable forms of instrumentation that can be used to evaluate air-conditioning refrigeration systems. System testing, sometimes known as commissioning, refers to getting the data you need to determine whether systems are functioning correctly.

This course presents the relevant issues and available methods for field testing HVAC systems, and explores and explains the use of specific instruments. The goal of testing HVAC systems is to determine if there are economically viable ways to implement energy conservation measures. This course is intended for facility engineering staff, management, and owners of small to large businesses and others interested in field testing and data acquisition instruments.

[M5] Technology Update

Are your business operations energy efficient? The development of technologies used in commercial and industrial facilities is in a perpetual state of flux. This class provides a comprehensive overview of the most current energy efficient technologies utilized in commercial and industrial facilities. This class provides a preview of other courses offered by presenting updates on the latest technologies and energy efficiency offerings being implemented today in the areas of lighting, chilled water systems, thermal energy storage systems, electric motors and drives, energy management systems, and distributed energy resources.

[M6] Natural Gas Systems Efficiency

Alternative title: **Gas Technologies for Energy Efficiency**

We have heard and read a lot about how important it is to conserve electricity in our homes, businesses, and communities. Equally important is the efficient utilization of natural gas as a fuel used in heating and other commercial and industrial technologies and applications.

This course introduces essential concepts as they relate to different technologies and applications that use natural gas as a fuel. In particular, we will explore human comfort, heat loss from conditioned space, principles of mechanical heating and heat pumps, the combustion process, boilers and burners, including boiler testing and tune-up, efficient boiler control, operations, and maintenance, and other energy efficiency ideas and suggestions for boilers, constant air volume air handling systems, variable air volume (VAV) systems, and indoor air quality.

[M7] Residential Energy Efficiency

Alternative titles: **Basic Electricity and Residential Energy Efficiency; Residential Energy Analysis**

This course is designed to provide a thorough understanding of residential energy-using systems, appliances, and devices and how to achieve energy savings. It discusses utility bill components and rates and how billing information can be used in conservation. This course introduces the basics of electricity, generation, transmission, and distributions, and other essential concepts that are presented in the context of residential energy use. This course is designed for both customers and utility company energy representatives and can be a one- or two-day course.

[M8] Distributed Energy Resources

This course presents an overview of Distributed Energy Resources (DER) and Distributed Generation (DG) technologies including the role of distributed technologies in an efficient market. Other topics include distribution vs. transmission, cogeneration, and power generation prime movers including reciprocating engine generation, turbines and microturbines; power quality and quantity; fuel cells, what they are and how they work and the different types; photovoltaics, including where it is used, how PV cells work, PV cell material, common configurations; grid-connected systems, utility interconnection policy, and more.

Alternative version: **Cogeneration: A Distributed Generation Technology**

In today's era of deregulation, many utility customers are investigating various applications for generating their own power, which can be isolated from or integrated with the utility power grid. This broader interest is reflected in the new and improved "Cogeneration" course, which is titled "Cogeneration: A Distributed Generation Technology."

This new course has been substantially revamped and now includes a discussion of distributed generation and its relationship to cogeneration technologies. The course also presents some new developments in generation technology, power management strategies, up-to-date regulatory information, information resources on the Internet, and much more.

[M9] Electricity Rates

This course is designed for internal utility company employees who need an understanding of the rates offered to customers. It is customized for the different utility companies.

This course describes background terms and concepts, and the various types of rates and their applications. Topics include electrical terms and concepts, transmission and distribution, load factor, energy and demand, ratchet rates, metering, the components that make up rates, ratemaking, and special rates.

[M10] Energy Buying Choices—Evaluating Your Options

Electric Utility Basics and the Restructured Electric Power Market

This workshop provides an introduction to the physical and regulatory structure of the electric utility system and includes an overview of electric power fundamentals (demand, energy, load factors), electric utility restructuring legislation, load aggregation, direct access, and the new players in electric power generation, transmission, distribution and sales.

[M11] “Watts Up” with my Air Conditioning Bill?

—How to Address Air Conditioning Billing Complaints

This course is designed for internal utility company customer service representatives who need an understanding of what makes customer bills higher during the summer months. This course covers the basics of comfort and air conditioning systems, things customers can do to help reduce their electric bills, what things in customer homes are using energy and why, and more.

[M12] Energy Efficiency for Residential Sales Agents

This two-hour seminar is designed specifically for sales agents of new houses. This session describes various energy-saving features and technologies for new homes and the benefits they offer homebuyers. Some measures are energy efficient windows and glazing, energy efficient heating and cooling equipment, ductworks, and other technologies including insulation, lighting, and appliances. This seminar also discusses national, state, and local incentive and rebate programs that are there to help the sales person and home buyers.

Specific Systems Technology

[S1] Compressed Air System Efficiency

Alternative title: **Compressed Air Systems**

Compressed air systems are found in a wide variety of industrial and commercial businesses, and are considered, along with electricity, natural gas, and water, as the "fourth utility." Compressed air is a remarkable utility, but it comes with a high price that is often overlooked. When designed, maintained, and managed correctly, you can reduce operating costs, increase system reliability, and improve production quality. This course helps participants recognize the efficiency opportunities that exist in most systems and covers compressor technology, controls, storage, and management techniques.

This full-day class begins with basic system concepts, terms, and energy units, and will proceed to describe typical system configurations and practices. It also includes types of compressors, system components, typical applications and operations, maintenance procedures, multiple compressor system strategies, and energy savings opportunities and practices.

An in-class exercise uses an example compressed air system, and asks participants to identify and describe some considerations that may help improve overall system efficiency and possibly avoid the need to purchase new equipment.

[S2] Commercial Refrigeration

Alternative title: **Efficient Technologies for Commercial Refrigeration**

There is a wide variety of commercial refrigeration equipment, from ice machines to supermarket food displays. Many refrigeration systems are old, operate inefficiently, and have few if any equipment improvements. With today's new refrigerants and technologies (such as floating head pressure, liquid sub-cooling and multiplexed compressors), there are many opportunities for improving the efficiency of existing equipment or for implementing new equipment.

This full-day course reviews elementary refrigeration concepts and introduces various energy efficiency techniques that, when properly applied, can save on energy costs. It addresses the latest refrigerant issues, efficiency measures, equipment options, and the benefits presented by these topics. This course is designed for owners and managers of refrigeration systems as well as service professionals.

[S3] Industrial Refrigeration

Alternative title: **Industrial Ammonia Refrigeration**

Learn to improve the operating efficiency of your industrial refrigeration systems and learn how to achieve energy savings up to 50% and more. This session reviews basic industrial refrigeration concepts and provides a system overview including typical industrial refrigeration practice, applications, equipment and configurations. These topics are followed by a discussion of high-efficiency heat rejection, floating head pressure control, compressor operation, system centralization, prime mover choices, real-time performance monitoring, and new refrigerant options. An in-class exercise explores the economics of different industrial refrigeration system configurations.

[S4] Evaporative Cooling for Commercial & Industrial Facilities

Evaporative cooling can be an energy efficient and cost-effective means of cooling residential, industrial, and commercial facilities. When compared with standard mechanical cooling, evaporative cooling can provide substantial energy savings. This type of cooling can be provided using several technologies including direct, indirect, or hybrid evaporative cooling, pre-cooling of condenser surfaces or by taking advantage of cooling tower “free cooling” techniques, either direct or indirect. In addition, this course presents the science of evaporative cooling, the different systems, typical commercial and industrial applications, economic considerations, and maintenance and water treatment.

[S5] Prime Movers

This course is designed for industrial, commercial, agricultural decision makers who are faced with many options about *prime mover* technologies—the electric motors or internal combustion engines that perform work by driving pumps or compressors. This course presents many of the factors to consider for owning and operating prime movers used in water pumping, compressed air, and refrigeration applications with an emphasis on energy efficiency and rate structures. Course participants receive Excel program software and a user’s guide that are used to present water pumping calculation examples.

Alternative title: **Comparing Motors and Engines as Prime Movers**

Alternative approach: **Electric Motors and Engines for Water Pumping**

Today’s agri-business decision makers are faced with many options about *prime mover* technologies—the electric motors or internal combustion engines—that might be considered for water pumping applications. This revised and improved seminar emphasizes the selection, use, and economics of both electric motors and gas-powered engines in water pumping applications. In addition to the seminar workbook, participants receive a spreadsheet program on diskette that they can use to make “what-if” economic comparisons.

The topics for this full-day session include:

- Fundamental terms and concepts regarding prime movers
- Features of electric motors and reciprocating engines and how they work
- A discussion of adjustable speed drives and power quality

- Emissions considerations, emission reduction technologies, and regulations for natural-gas-powered engines
- Economic analysis of using electric motors and reciprocating engines
- Water pumping basics
- Several water pumping case studies

[S6] Thermal Energy Storage

This one-day course presents the fundamentals of thermal energy storage (TES) systems — one of today's state-of-the-art options available for consideration by building owners and managers. Thermal energy storage—also called “cool storage” or “off-peak air conditioning” systems—is a technology that is united with air distribution systems to provide air conditioning for commercial and industrial buildings, or with other standard systems for industrial process cooling.

Conventional chillers or industrial-grade ice-making machines are used produce cooling capacity during non-peak generation hours which is stored in the form of chilled water or some type of “ice.” The stored energy is then used to supply cooling capacity for air conditioning or process cooling.

This course discusses the purpose of TES and how TES functions, TES system technologies, configurations, and applications, and economic considerations. We also explore the potential benefits and drawbacks. Includes a case study.

[S7] Heat Pump Water Heating for Commercial & Industrial Facilities

Alternative title: **Heat Pumps for Commercial and Industrial Facilities**

This course addresses the fundamentals of commercial and industrial heat pump operations, applications in commercial domestic water heating for hotels, hospitals, government and other facilities, industrial water and fluid heating, and indoor-outdoor swimming pool applications.

This course covers the essentials about types of heat pumps and compressors, commercial heat recovery heat pump systems, heating system efficiency, NOx emission reduction, emerging trends, types of refrigerants and working fluids, new and creative applications, and more. This course also provides feasibility studies for heat pumps and case studies.

[S8] Natural Gas Compression and Oil Extraction

This one-day course presents some important aspects of the gas and oil industry. Among other things, this course explores how the gas and oil industry uses both electric motors and gas-powered engines to do a variety of tasks. It presents the fundamentals of the gas and oil industry, what's involved in producing gas and oil, who the players are, and what the opportunities are for these customers for using electricity wisely in their operations.

[S9] Clean Profits for Drycleaners

—Cutting Your Costs through Energy Efficiency

This two-hour session helps owners and operators of drycleaners understand energy efficiency considerations that can help save money on utility bills. This course presents concepts that are easy to understand and discusses why it's important to be aware of what aspects of your business create energy expenses and provides suggestions for how you can reduce them. Topics include steam systems, boilers, lighting and other equipment, financial considerations, energy efficiency audits, and an action plan.

[S10] Clean Profits for Your Coin Laundry

—Cutting Your Costs through Energy Efficiency

This two-hour session helps owners and operators of coin laundries understand energy efficiency considerations that can help save money on utility bills. This course presents energy efficiency concepts and discusses why it's important to be aware of what aspects of your business create energy expenses and provides suggestions for how you can reduce them. Topics include water heaters and keeping water heaters efficient, washing machines, dryers, lighting and other equipment, financial considerations, energy efficiency audits, and an action plan.

Speaker's Bio, David M. Wylie, P.E.

During the oil crisis of the early 1970's, David was finishing engineering school at Cal Poly San Luis Obispo and subsequently achieved a Registered Professional Engineer License in California. Energy efficiency was getting more attention and an interest in cost analysis led David to completing an MBA at National University which provided him with even more tools to analyze energy efficiency investment from both a mechanical and financial perspective.

David and his two partners began working together in 1976 and the Engineering Management Consulting firm of ASW, located in Tustin, California, today has a staff of over 25. Their work experience covers the range of energy engineering including research, development, program design, measurement, feasibility study of electrical/mechanical systems and energy supply for commercial and industrial facilities.

David, who holds a college teaching credential, teaches what he does and knows about, and has developed over 20 courses that address energy efficient systems. He has an ability to take sophisticated engineering concepts and relate them in a way you can understand, and the materials are presented in a friendly and practical way.

Several of David's articles have been published in trade magazines and he has written a book titled "New Refrigerants for Air Conditioning and Refrigeration Systems" that was published in 1996. ASW Engineering has received awards for innovations in engineering from the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Southern California Edison, and California's Governor. He is presently the President of the Southern California Association of Professional Energy Managers.