PROJACS ACADEMY
by egis

Advanced HVAC Design, Maintenance & Operation Techniques

تقنيات متقدمة في تصميم وتشغيل وصيانة أنظمة التكييف والتبريد

30 January – 03 February 2023

Dubai / UAE

Introduction

Heating, ventilation and air conditioning (HVAC) systems are essential for providing indoor comfort and air quality in various types of buildings. HVAC systems account for a significant portion of the energy consumption and operating costs of buildings, and therefore require careful design, maintenance and operation to ensure optimal performance and efficiency. This training course will cover the advanced aspects of HVAC design, maintenance and operation techniques, including the latest standards, technologies and best practices in the industry.

Objectives

By the end of this training course, participants will be able to:

- Understand the principles and components of HVAC systems and how they interact
- Apply advanced design methods and tools to optimize HVAC system performance and energy efficiency
- Implement effective maintenance strategies and procedures to ensure HVAC system reliability and longevity
- Troubleshoot common HVAC system problems and identify solutions
- Evaluate different HVAC system operation techniques and their impact on indoor comfort and air quality

Who Should Attend?

- HVAC engineers, designers, consultants and contractors who are involved in the design, installation, commissioning, operation and maintenance of HVAC systems
- Facility managers, building owners, operators and occupants who are responsible for or interested in the performance and efficiency of HVAC systems
- Anyone who wants to enhance their knowledge and skills in advanced HVAC design, maintenance and operation techniques

Course Outline

Day One

HVAC systems design

- **Heat load**
  - Sources of heat load
  - Using the equation of each heat load for analysis and possible reduction in the heat load.
  - Air treatment and human comfort
  - Evaluating and studying the outside and inside design conditions to meet the human comfort
  - Daily and monthly heat load profiles, how they affect the heat load

- **Selecting the type of AC system**
  - According to the size of total heat load
  - According to type of compressors
  - According to condensing method.
  - According to type of usage (Big centralized systems servicing complexes & multi buildings).
  - The C.O.P./EER with examples.

Day Two

- **The piping system for chilled water applications**
  - Velocity/friction loss VS initial and running cost. How to decide which way to go.
  - Closed or open type systems. (Advantages and dis-advantages of each type).
  - Pressure breakers and the need for high rise buildings
  - Effect of pressure breakers on evaporating temp., chilled water temp., C.O.P., air side, initial and running cost.
  - Expansion and contracting of the piping circuits and the selection of expansion joints, pressurized expansion & make up tanks.

- **Refrigerants and their effect on AC systems selection and the environment.**

Day Three

- **How cooling towers work for centralized water cooled systems.**
- **Thermal storage**
  - Types of thermal storage systems.

- Air cooled systems Load shifting (partial and full), daily and weekly, case study with calculations
- and comparison of C.O.P.

- **Ventilation, infiltration, ex-filtration. How to minimize their heat loads**
- **The conclusion (Selecting the right AC system based on):**
  - Size of installation and the limitations on our choice according to job size and the readymade manufacturers equipment.
  - Initial and running cost
  - Type, size and number of compressors
  - Type of condensers. (Air, water, evaporative and radiators)
  - Evaporating temperature and the type of heat exchange in coolers and air side.
  - Evaluating the C.O.P.

Day Four

Total system reliability

- What reliability means (Redundancy, stand by equipment/components for commercial and industrial applications)
- The difference between commercial individual systems and centralized systems.

Centralized control and management

- Definitions and the need for control narrative, BMS, SCADA and DCS systems
- How BMS, SCADA & DCS systems improve the efficiency & reliability and their effect on initial cost

District cooling

- Introduction to district cooling
- Why district cooling (For the real state developers/clients, the nation and environment).
- The choice of condensing method for district cooling systems

Day Five

Introduction to Inlet air cooling to gas turbines

- Iso conditions for gas turbines and nominal capacity for air conditioning units.
- Gas turbines power output and the relation with ambient conditions and site elevation
- Why we need to cool the inlet air to gas turbines
- Base and peak load inlet air cooling and their economics.

- Load shifting and the need for thermal storage (Build up cycle and burn off cycle)
- Types of thermal storage for inlet air cooling

Open discussions on the HVAC design

Operation and Maintenance

- Scheduled preventive maintenance routines for DX and chilled water systems
- Daily log sheets and the items to record and monitor.
- Importance of pre-commissioning tests, cold and hot tests for proper maintenance
- Utilizing records history for improvement of systems reliability
- Hand over package and its importance for proper maintenance.
- Training of hands on staff for better understanding of the systems to reduce down time and operational cost.
- Operation and maintenance case studies
- Open discussions including any specific related cases from attendees.
- Feedback from attendees and distribution of certificates
- Continuation of open discussions on operation and maintenance

Training Method

- Pre-assessment
- Live group instruction
- Use of real-world examples, case studies and exercises
- Interactive participation and discussion
- Power point presentation, LCD and flip chart
- Group activities and tests
- Each participant receives a binder containing a copy of the presentation
- slides and handouts
- Post-assessment

Program Support

This program is supported by interactive discussions, role-play, case studies and highlight the techniques available to the participants.

Schedule

The course agenda will be as follows:

- Technical Session 08.30-10.00 am
- Coffee Break 10.00-10.15 am
- Technical Session 10.15-12.15 noon
- Coffee Break 12.15-12.45 pm
- Technical Session 12.45-02.30 pm
- Course Ends 02.30 pm

Course Fees*

- **3,200 USD**
  **VAT is Excluded If Applicable*

المقدمة

تعد أنظمة التدفئة والتهوية وتكييف الهواء (HVAC) ضـــرورية لتوفير الراحة الداخلية وجودة الهواء في أنواع مختلفة من المباني. تمثل أنظمة التدفئة والتهوية وتكييف الهواء (HVAC) جزءًا كبيرًا من اســتهلاك الطاقة وتكاليف التشــغيل للمباني، وبالتالي تتطلب تصــميمًا وصــيانة وتشــغيلًا دقيقًا لضــمان الأداء الأمثل والكفاءة. ســتغطي هذه الدورة التدريبية الجوانب المتقدمة لتصــميم وصــيانة وتشــغيل أنظمة التدفئة والتهوية وتكييف الهواء، بما في ذلك أحدث المعايير والتقنيات وأفضل الممارسات في الصناعة.

الأهداف

بنهاية هذه الدورة التدريبية، سيكون المشاركون قادرين على:

- فهم مبادئ ومكونات أنظمة التدفئة والتهوية وتكييف الهواء وكيفية تفاعلها
- تطبيق أســاليب وأدوات التصــميم المتقدمة لتحســين أداء نظام التدفئة والتهوية وتكييف الهواء وكفاءة الطاقة
- تنفيذ اســتراتيجيات وإجراءات الصــيانة الفعالة لضــمان موثوقية نظام التدفئة والتهوية وتكييف الهواء وطول العمر
- استكشاف مشكلات نظام التدفئة والتهوية وتكييف الهواء الشائعة وإصلاحها وتحديد الحلول
- تقييم تقنيات تشــغيل نظام التدفئة والتهوية وتكييف الهواء (HVAC) المختلفة وتأثيرها على الراحة الداخلية وجودة الهواء

الحضور

- مهندســي التدفئة والتهوية وتكييف الهواء والمصــممون والاســتشــاريون والمقاولون المشــاركون في تصميم أنظمة التدفئة والتهوية وتكييف الهواء وتركيبها وتشغيلها وصيانتها
- مدراء المرافق وأصــحاب المباني والمشــغلين والشــاغلين المسؤولين أو المهتمين بأداء وكفاءة أنظمة التدفئة والتهوية وتكييف الهواء (HVAC)
- أي شــخص يرغب في تعزيز معارفه ومهاراته في تقنيات التصــميم والصــيانة والتشــغيل المتقدمة لأنظمة التدفئة والتهوية وتكييف الهواء (HVAC).

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