HOW TO PREVENT FAILURES IN HVAC SYSTEMS
"PROVEN AND TESTED SOLUTIONS"

INTRODUCTION

When an air conditioning system fails to perform properly, the underlying cause will usually fall into one or more of the following categories : poor design, operational limitations, poor installation, improper adjustment or equipment failure. The aim of this course is to discuss important factors that must be considered to achieve proper environmental conditions in HVAC applications during the operational phase.
At the end of this course participants will be able to :

- Need for comfort and acceptable indoor air quality and how to maintain it
- Identifying pitfalls in air distribution and taking remedial action
- Operate refrigeration systems and accessories in air conditioning systems – situations to beware of and how to avoid them
- Carry out inspection, fault finding and trouble shooting
- Understand the importance and use of building system diagnostics as a tool for the proper maintenance of HVAC systems.

PRESENTER

Martin Braun

Martin Braun has been involved in Adult Education for the last seventeen years for the South African Institute for Refrigeration and Air conditioning in Johannesburg/Pretoria area. He lectures in the subjects of Air conditioning, Refrigeration and Thermodynamics. He received a B. Sc Mechanical Engineering degree from the university of Eindhoven in Holland. He is a Registered Professional Engineer with the Engineering Council of South Africa. A member of the South African Institute for Refrigeration and Air conditioning and chairman of the Air conditioning and Refrigeration Industrial Council of South Africa.
In addition to his part time involvement in education he has been working for the last 25 years in the air conditioning and refrigeration field as a design engineer, contracts engineer and consultant and has been involved in major comfort and industrial air conditioning systems as well as mechanical refrigeration systems for abattoirs, pharmaceutical and food processing plants. During this period he was also responsible for the design of filtration and ventilation systems for a nuclear power plant.

PROGRAM

DAY ONE

MODULE 1 : COMFORT AND THE NEED FOR AIR CONDITIONING AND VENTILATION

- Human comfort zone, air cleanliness, medical and economic considerations
- Calculation of air quantity, natural ventilation, forced ventilation
- Black globe temperature, wet bulb globe temperature, effective temperature
- The comfort chart

MODULE 2 : INDOOR AIR QUALITY

- Composition of air and normal air contaminants
- Air quality and ventilation standards, legislation and guidelines
- Noise levels and control, Illumination standards
- Building air quality action plan
- Air quality procedures and corrective action
- Indoor air quality management and HVAC check list

MODULE 3: INTRODUCTION TO PSYCHROMETRICS FOR AIR CONDITIONING SYSTEM ANALYSIS

- Use of chart in understanding operation of air conditioning systems
- Analysis of basic air conditioning processes

DAY TWO

MODULE 4: SELECTING THE CORRECT AIR CONDITIONING SYSTEM FOR THE JOB

- System components & Methods of control
- Unitary equipment, Central systems & Zoning

MODULE 5 : ACHIEVING PROPER ROOM AIR DISTRIBUTION

- Types of air outlets and inlets
- Air patterns, Specific applications
- Distribution, Sizing & Application
- Industrial ventilation and exhaust systems

MODULE 6 : AIR FILTRATION SYSTEMS AND EQUIPMENT

- Filer performance characteristics
- Selection, installation, operation and maintenance

DAY THREE

MODULE 7 : STICKING TO THE FUNDAMENTALS WHEN SELECTING FANS AND DUCT SYSTEMS

- Types of fans, fan performance and fan laws
- Fan performance in a system, Duct construction & Sizing ductwork
- Costing of duct systems & Duct cleaning

MODULE 8 : BASIC OPERATION OF REFRIGERATION SYSTEMS

- Refrigerants & Refrigeration cycle
- The simple saturated refrigeration cycle, Common service operations, Testing and charging

MODULE 9: REFRIGERATION CYCLE ACCESSORIES AND CONTROLS

- Metering devices & Solenoid valve
- Sight glass & Filter-drier, Accumulator & Receiver, Check valve & Muffler
- Expansion devices, Suction-liquid heat exchangers

MODULE 10 : REFRIGERANT PIPING SYSTEMS

- Basic principles, Layout and sizing
- Line sizing & Precautions, Single and multiple systems
- Pipe hanging and insulation

DAY FOUR

MODULE 11: REFRIGERATION COMPRESSORS CONSTRUCTION LUBRICATION AND PROTECTION

- Compressor capacity, system capacity and capacity control
- Compressor installation, maintenance and operation
- Lubrication and protection methods

MODULE 12 : CONDENSING EQUIPMENT

- Purpose and basic operating principles
- Water & Air cooled condensers
- Factors affecting performance
- Selection parameters & Installation procedures

MODULE 13 : COILS FOR COOLING AND DEHUMIDIFICATION

- Physical features, Factors affecting performance
- Selection parameters, Direct expansion or chilled water

MODULE 14 : WATER PIPING SYSTEMS

- Typical condenser water systems
- Chilled water distribution systems
- Expansion tanks and air elimination
- Matching pumps to systems, Water chillers and load control

DAY FIVE

MODULE 15 : CONTROL OF THE INSIDE CONDITION TO PRODUCE A COMFORTABLE ENVIRONMENT.

- Need for control & Control systems
- Types and Selection of control modes, Variables to be controlled
- Measuring elements & Control systems

MODULE 16: COMMISSIONING TO ACHIEVE A PROPERLY OPERATING SYSTEM

- The need for commissioning, Air volume measurement
- Testing, adjusting and balancing procedures

MODULE 17: FAULT FINDING AND TROUBLE SHOOTING: PILLS FOR SICK SYSTEMS

- Importance of trouble shooting, Trouble shooting guides
- Developing trouble shooting skills
- Trouble analysis & Tools required

MODULE 18: PLANNED MAINTENANCE AND BUILDING SYSTEM DIAGNOSTICS

- Mechanical maintenance planning
- Economics of planned maintenance, Computers in maintenance
- Maintenance programme requirements & Schedules
- Organising for energy management
- Implementing and energy management system