

The Union of African Association and 25th Webinar



The Importance of Temperature Controls in HVAC-R

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OBJECTIVE

- **What is HVAC control?**
- **Why HVAC Control is Importance?**
- **How do HVAC control systems work?**
- **Components of Temperature controls**
- **Types of Temperature controls**
- **Application of HVAC controls**
- **Diagnosing common Temperature fault**
- **Review**



What is HVAC controls?

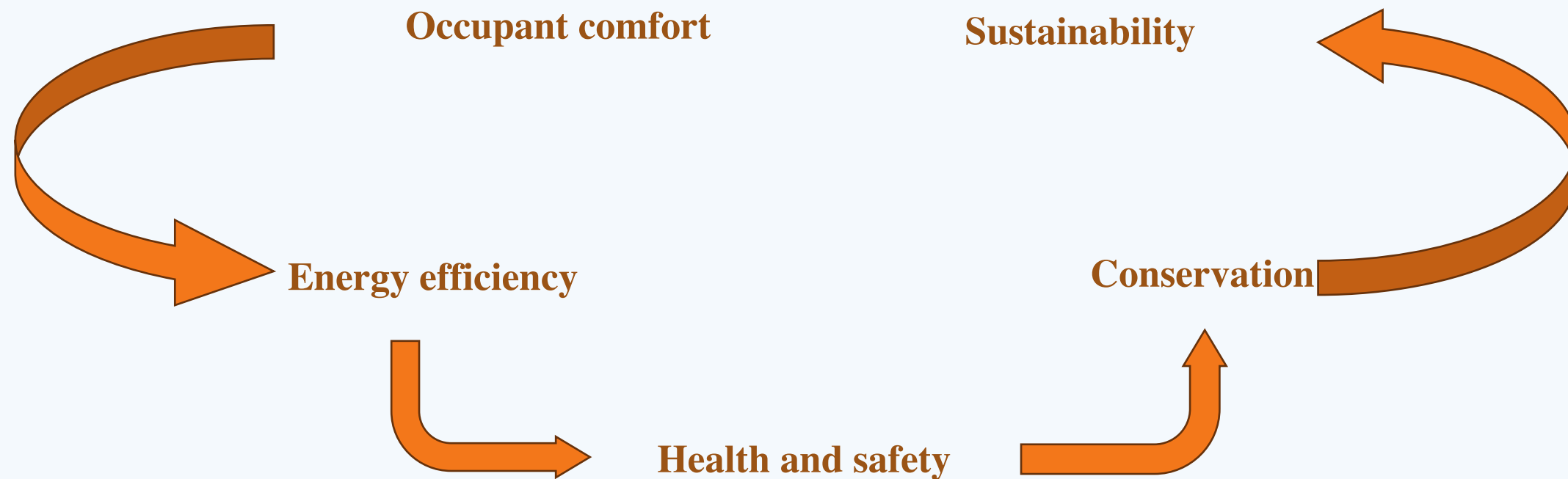
- The HVAC control system is a computerized mechanism that adjusts the heating, air conditioning, and ventilation components within a building. HVAC systems are designed to control the temperature to provide comfort, improve indoor air quality, and ensure the efficient use of energy and maximizes performance.





Why use controls in HVAC?

- Temperature controls in HVAC (Heating, Ventilation and Air Conditioning) are essential for several important reasons





How do HVAC control work?

- Modern HVAC control systems regulate indoor temperatures, manage humidity, improve the air quality in buildings by filtration and purification, and replenish oxygen levels, which increase occupants' comfort and maintain a healthy environment.
- In a centralized HVAC system, both warm and cool air can be routed with the same ducts and regulated by one thermostat. With larger HVAC systems and more complex equipment, there are larger and more complex sequences of operations.

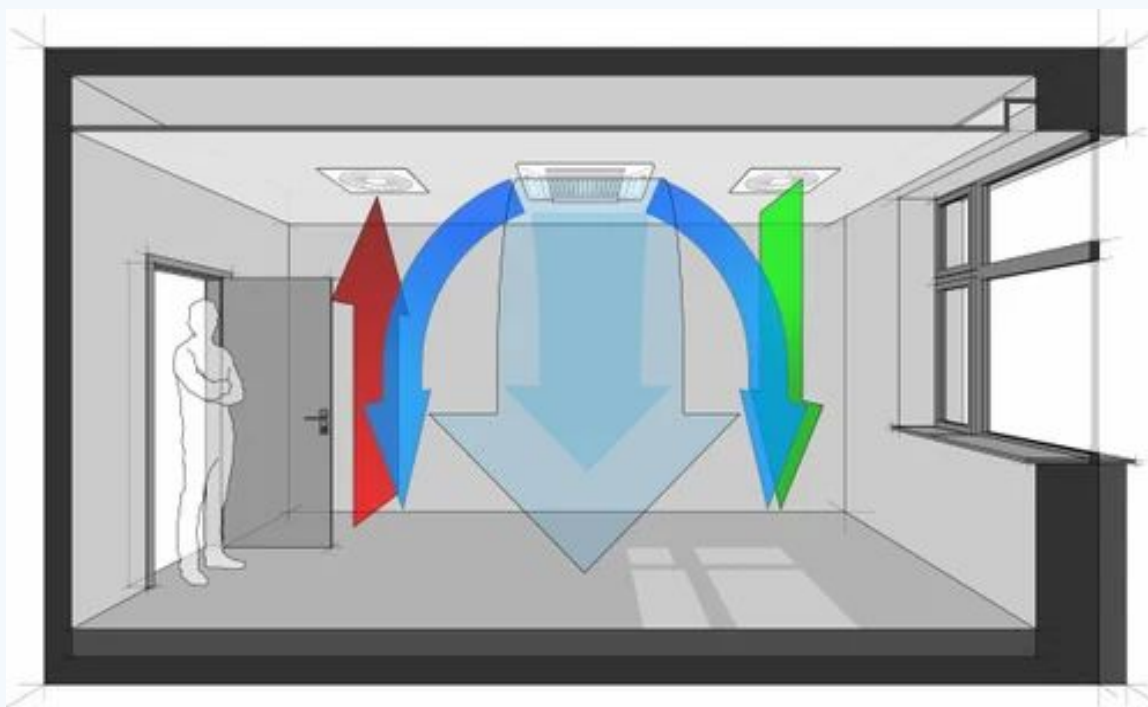
HVAC controls work by controlling the following:

- Temperature
- Pressure
- Air Quality
 - Humidity
 - The Percentage of CO₂
 - The Percentage of Oxygen



The Control of Temperature

- In HVAC, temperature controls regulate indoor temperatures to maintain comfort. They typically consist of thermostats, sensors, controllers, and heating or cooling elements. Users can set a desired temperature on the thermostat, and the control system works to achieve and maintain that temperature by adjusting heating or cooling equipment.

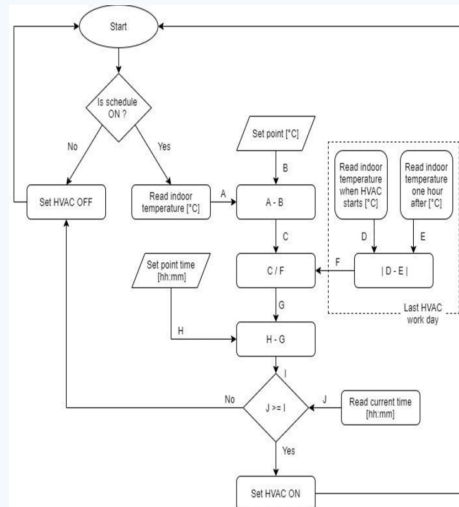
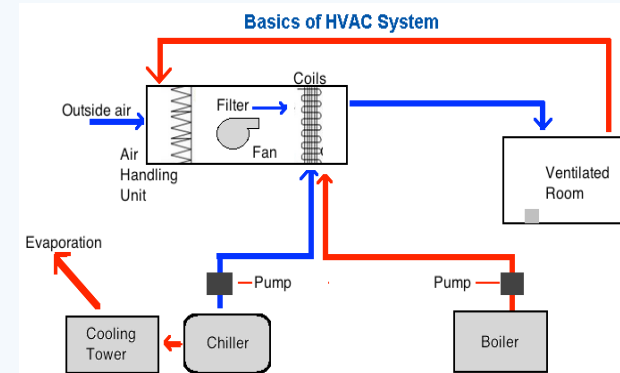




Components of Temperature controls

Temperature control involves several components and processes within an HVAC system:

- The Thermostat
- The Heating and Cooling Equipment
- The sensors
- The Control Algorithms
- The Variable-Speed motor (Controls)
- The Dampers and Valves





Types of Temperature controls

- **Thermostats Control**

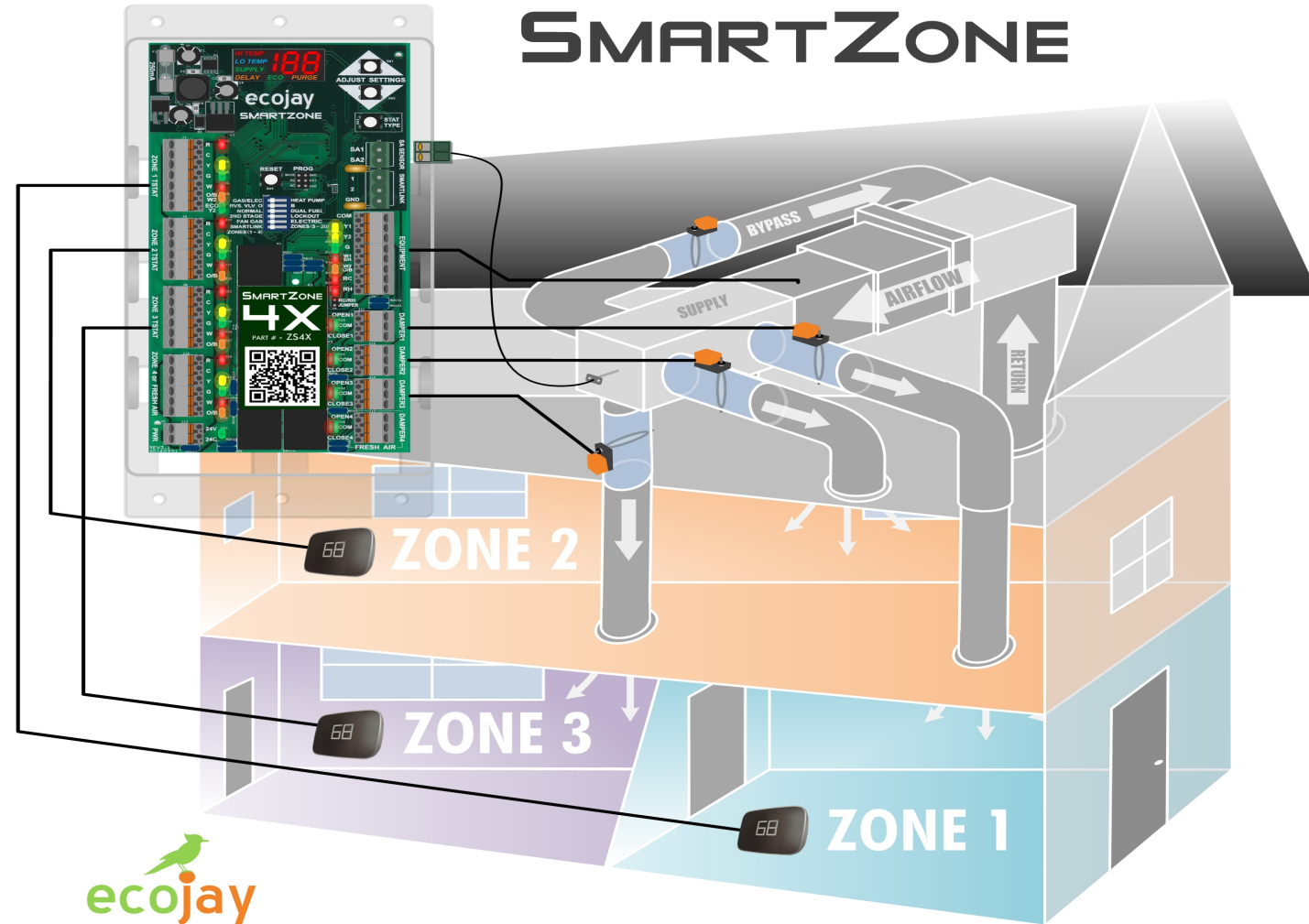
- Manual/non-programmable thermostat
- Programmable Thermostats
- Smart Thermostats

- **Zone Control**

- Direct Digital Control (DDC)
- Building Automation Systems (BAS)
- Energy Management Systems

- **Sensor Control**

- Occupant sensor
- Temperature sensor
- Humidity sensor



Application of Temperature controls



Residential HVAC System

Types

- Single-Family Homes
- Multi-Family Buildings

Control use

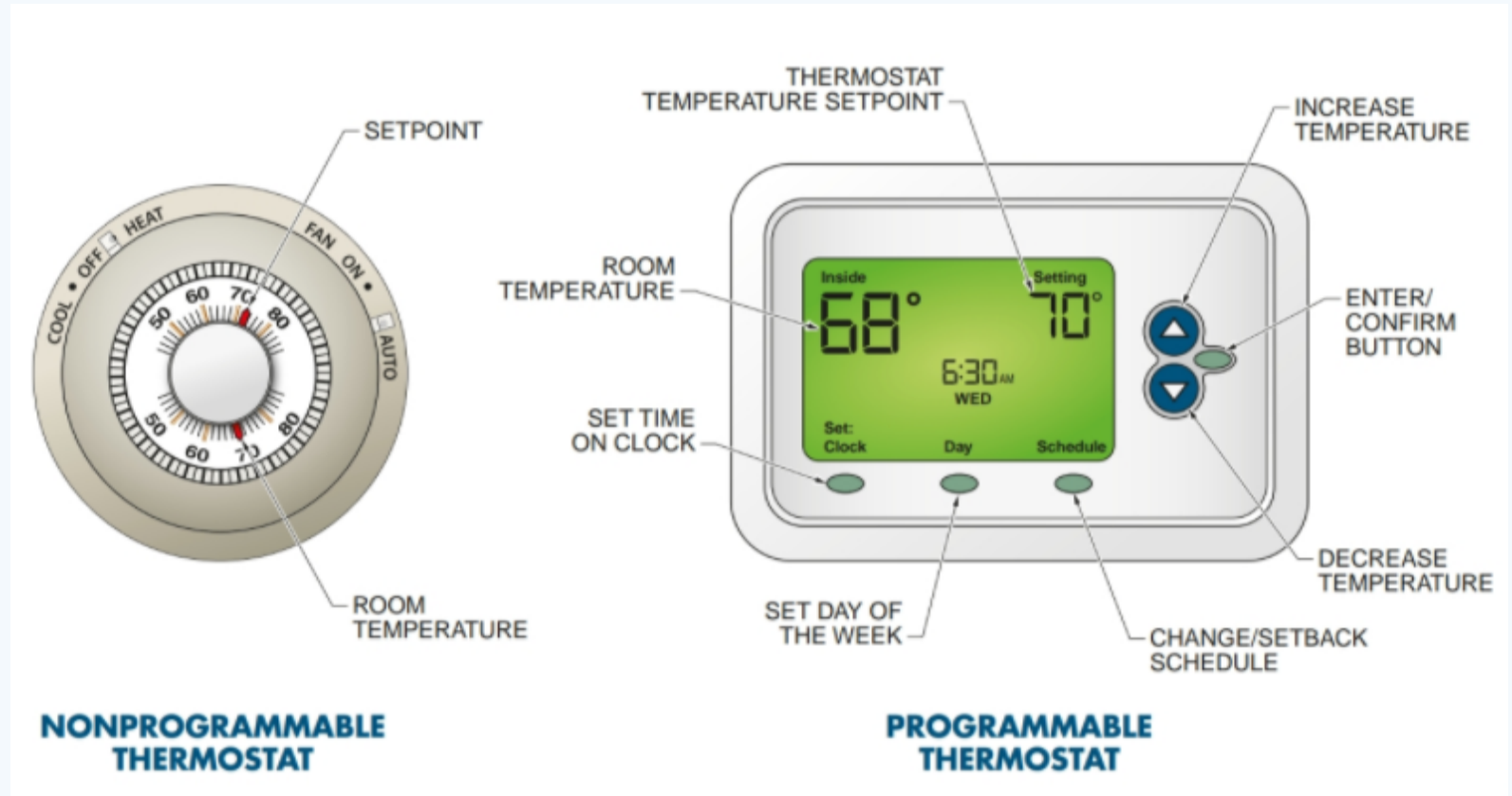
- Thermostat

Manual Control

Programmable

Smart

- Zone Control



Application of Temperature Controls - Humidity Aspect



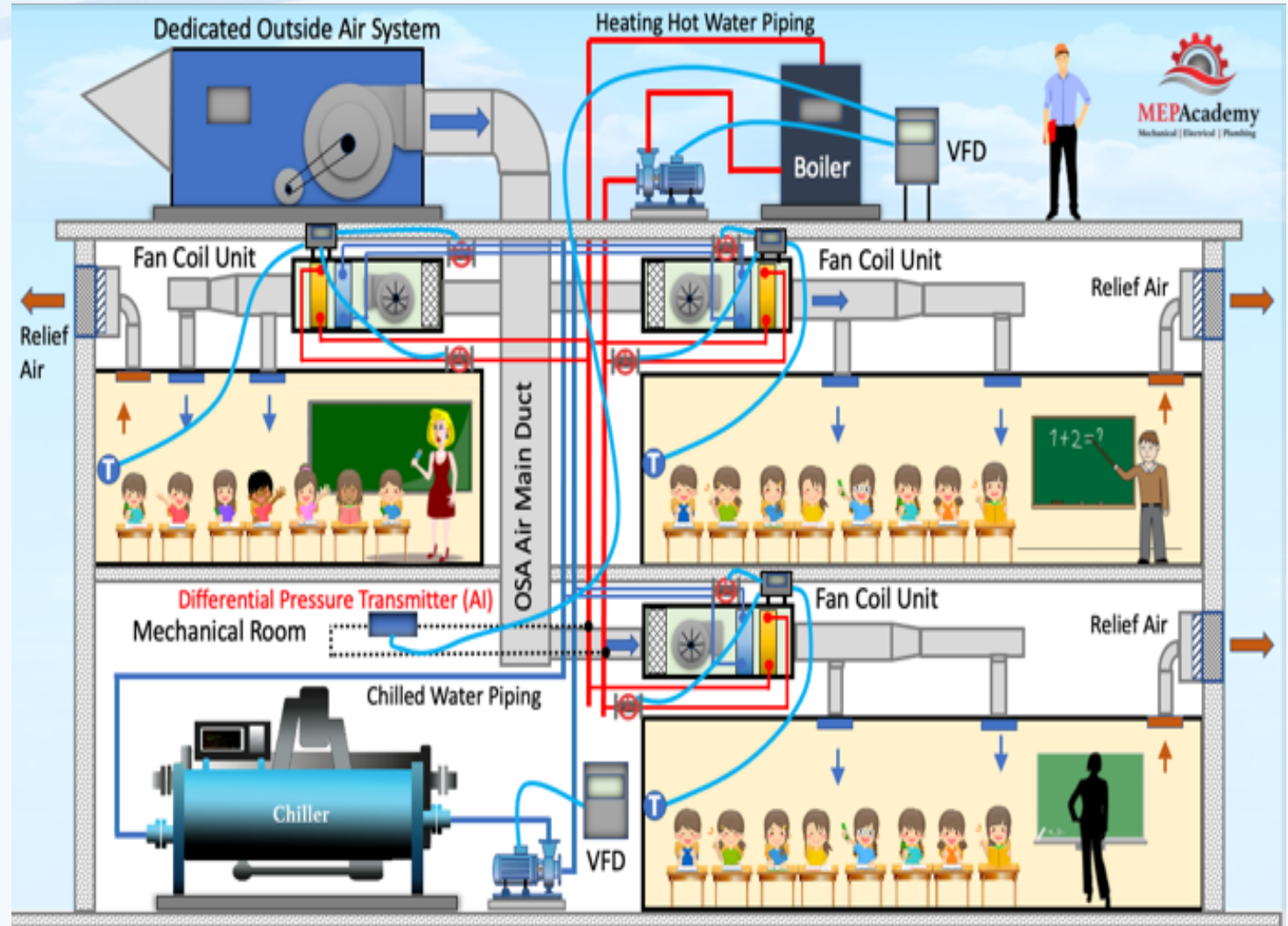
Commercial HVAC system

Types

- Office Buildings/Restaurants/Hotels
- Hospitals and Healthcare Facilities/
- Retail Spaces
- Educational Institutions – Libraries & Museums
- Data Centers/Entertainment Venues

Control use

- Zone Control



The Control of Humidity

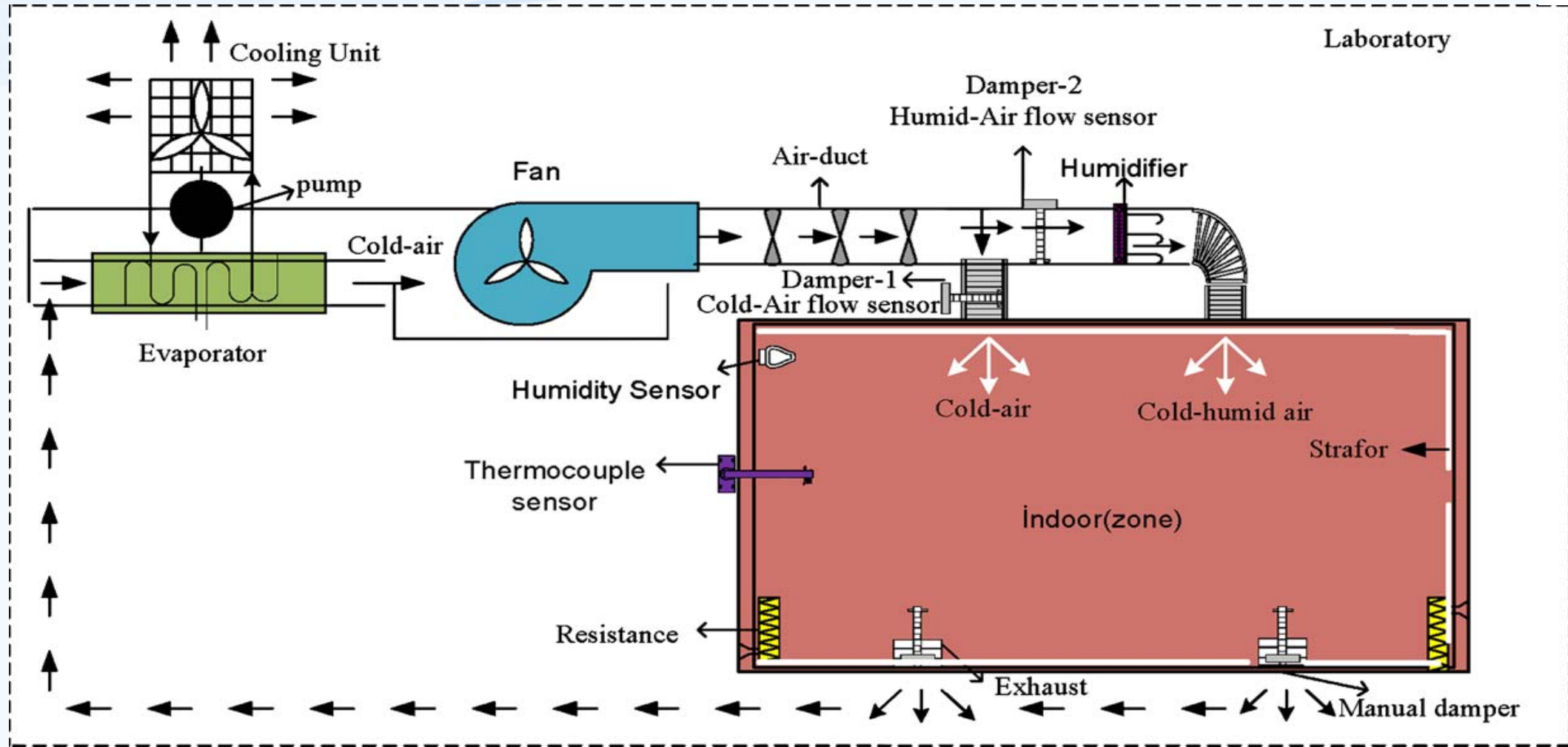


Fig. 1. The schematic view of the HVAC system having only one zone (indoor).

Application of Temperature control - Air Quality Aspect



Industrial HVAC system

Types

Laboratories / Cleanrooms / Green houses / Livestock Facilities

Control use

- Direct Digital Control (DDC)
- Programmable Logic Controllers (PLCs)
- Thermal Control Panels
- Variable Frequency Drives (VFDs)
- Ductwork and Ventilation





Diagnosing common Temperature Control's fault in various system

- HVAC (Heating, Ventilation, and Air Conditioning) Systems

Common Faults:

- Inaccurate temperature readings.
- Temperature fluctuations.
- System not heating or cooling as expected.

Potential Causes and Diagnostic Steps:

Thermostat Issues	Sensor Problems	Clogged Filters	Refrigerant Leaks (for cooling systems)
<ul style="list-style-type: none">• Check if the thermostat is set to the correct temperature.• Replace batteries if the thermostat is battery-powered.• Check for loose or damaged wiring.	<ul style="list-style-type: none">• Inspect temperature sensors for dirt or damage; clean or replace as needed.• Ensure sensors are correctly positioned	<ul style="list-style-type: none">• Check and replace air filters regularly.• Clogged filters can hinder airflow and temperature control.	<ul style="list-style-type: none">• Inspect for visible refrigerant leaks.• Repair leaks and recharge refrigerant.



Diagnosing common Temperature Control's fault in various system

- Laboratory and Scientific Equipment

Common Faults:

- Temperature fluctuations.
- Inaccurate temperature control.
- Failure to maintain setpoint.

Potential Causes and Diagnostic Steps:

Calibration Issues	Heating Element or Cooling System Problems	Ventilation and Airflow
<ul style="list-style-type: none">• Verify the accuracy of temperature sensors and controllers.•• Recalibrate or replace components as needed.	<ul style="list-style-type: none">• Inspect heating elements or cooling systems for damage.••• Test the operation of heating/cooling	<ul style="list-style-type: none">• Ensure proper ventilation and airflow to maintain temperature stability.•• Check for obstructions or blockages in ventilation systems.

Review



- Temperature controls in HVAC (Heating, Ventilation and Air Conditioning) are essential for several important reasons:
 - **Occupant comfort**
 - **Energy efficiency**
 - **Health and safety**
 - **Conservation**
 - **Sustainability**
- HVAC controls work by controlling the following:
 - Temperature
 - Pressure
 - Air Quality
 - The percentage of CO₂
 - The percentage of Oxygen
 - Humidity
- **Types of Temperature controls** - Manual Control, Thermostats (programmable & Smart), Zoned Controls, DDC, BAS, EMS, Cloud Base & Demand Response controls
- **Application of temperature controls in various system** - Single-Family Homes/Multi-purpose Buildings/ Plantation & Production
- **Diagnosing common temperature control's fault in various system** -Inaccurate temperature readings/Temperature fluctuations/ System not heating or cooling as expected.



Thanks for Listening

Question & Answer