SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 19OE219 BUILDING AUTOMATION

IV YEAR /VII SEMESTER

Unit 1- HVAC SYSTEM

Topic : pH Sensor

Introduction

- A pH sensor in an HVAC (Heating, Ventilation, and Air Conditioning) system is **used to measure the acidity or alkalinity of a liquid, often water**, within the system.
- pH is a measure of the **concentration of hydrogen ions** in a solution and is expressed on a scale from 0 to 14, with 7 being neutral, values below 7 indicating acidity, and values above 7 indicating alkalinity.

Working

pH Electrode:

- The pH sensor consists of a pH electrode, which is typically made of a **special glass membrane**.
- This membrane is **sensitive to changes in hydrogen ion concentration**.
- The electrode is designed **to generate a small electrical potential** (voltage) that varies with the pH of the liquid it is in contact with.

Reference Electrode:

- Alongside the pH electrode, there's usually a **reference electrode** that **maintains a constant reference voltage.**
- This helps ensure accurate measurements by compensating for changes in the electrical potential due to factors other than pH.

- **Electrolyte Solution:** The reference electrode is filled with an electrolyte solution that establishes a stable reference potential.
- This solution is usually a gel or liquid that contains ions to maintain a constant voltage.
- **Signal Conditioning Circuit:** The electrical potential generated by the pH electrode and the reference electrode is very small, often in millivolts.
- To make this signal usable for measurement and control purposes, a signal conditioning circuit amplifies and processes the voltage signal.

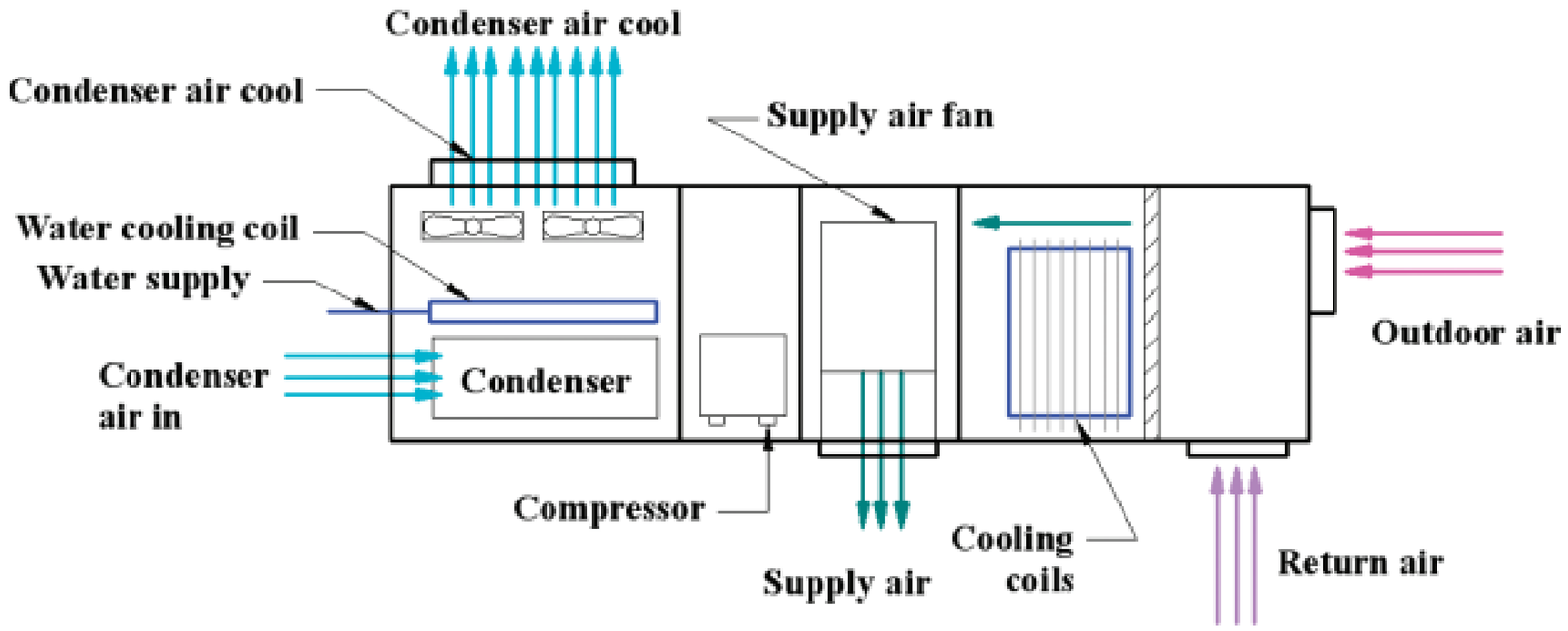
- **pH Meter or Controller:** The amplified signal is sent to a pH meter or a pH controller.
- A pH meter displays the pH value directly on its screen, while a pH controller can use the pH value to make decisions or adjustments in the HVAC system based on predetermined set points.
- **Calibration:** pH sensors require periodic calibration to ensure accuracy.
- Calibration involves exposing the sensor to solutions with known pH values (calibration buffers) and adjusting the sensor's reading to match the expected values.
- This compensates for any deviations in sensor performance.

Application

- **Water Treatment:** HVAC systems often involve water-based processes. Monitoring the pH of water used in cooling towers, humidifiers, or other components helps ensure optimal water quality, preventing scale buildup, corrosion, and microbial growth.
- **Chemical Dosage:** In water treatment systems, pH sensors can be used to control the addition of chemicals that adjust the pH to desired levels. This ensures that treatment chemicals work effectively.
- **Boiler Water:** pH sensors can monitor the pH of water in boilers. Maintaining the proper pH range is critical to prevent corrosion and scale formation within the boiler.
- **Environmental Control:** pH sensors might be used in systems that require precise control of the pH of liquids, such as in hydroponic HVAC setups.

Assessment

1. Can you say this shown in fig. is the example of which method of HVAC?



References

1. Shengwei Wang, “ Intelligent Buildings and Building Automation”, Routledge 2010.
2. Reinhold A, Carlson Robert A, Di Giandomenico, “Understanding Building Automation Systems: Direct Digital Control, Energy Management, Life Safety, Security Access Control, Lightning, Building”, R. S Means company limited, 1st edition, 1991.

Thank You