

# HVAC for Biopharma Professionals

## 2-Day Comprehensive Training (Online)

17 Nov (Fri) & 20 Nov (Mon) 2023

17 slides

**ATUL MATHUR**

CONTENT ALIVE

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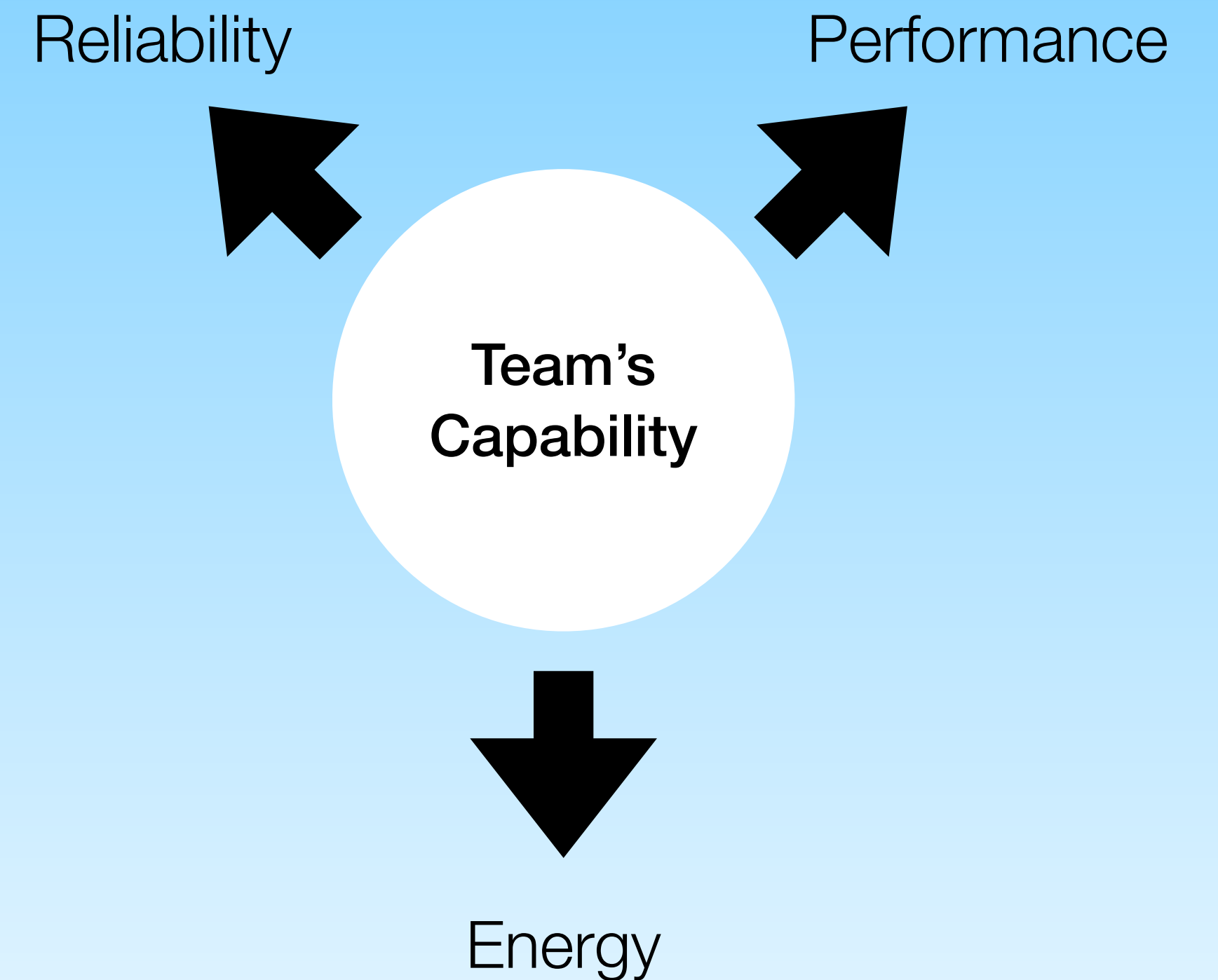
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# 01 HVAC Training: Why?

HVAC systems maintain critical GMP environmental conditions (temperature, humidity, cleanliness, pressures) in biopharma facilities. The **performance** and **reliability** of these systems are essential to site operations. Consuming 50-60% of overall **energy**, these systems also have a direct impact on the cost of operations and sustainability.

In the end, however, all three objectives (**performance, reliability and energy**) depend on a crucial ingredient: **Capability** of the team that operates and manages the HVAC systems.

This training has been especially designed to enhance that capability.



# 02 Target Audience & Training Objectives

## Biopharma industry professionals

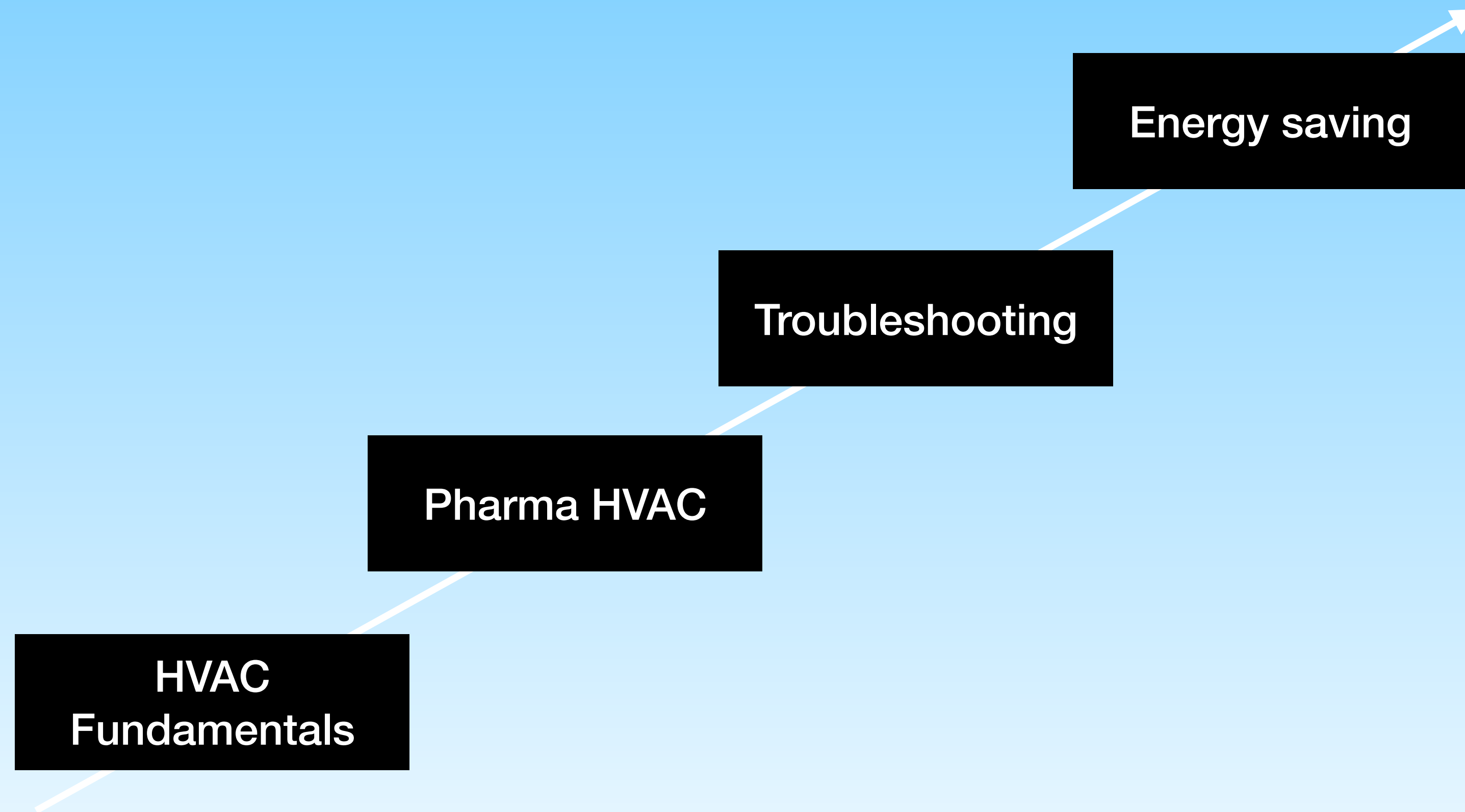
- Senior engineers, engineers, supervisors, senior technicians
- Involved in HVAC maintenance & operations, projects, commissioning & qualification

## Objectives

- **Fundamentals:** Consolidate HVAC fundamentals relevant to routine operations
- **Pharma HVAC & GMP:** Gain understanding of HVAC design configurations for biopharma plants and applicable GMP regulations and standards
- **Troubleshooting:** Learn how to systematically troubleshoot HVAC problems
- **Energy:** Identify various energy-saving opportunities in pharma HVAC systems

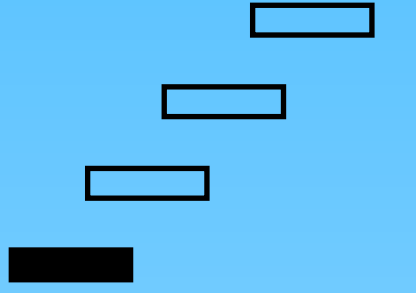
# 03 Training Outline

# HVAC Training - Key Focus Areas



Details of each component are on the next four slides

# HVAC Training: Fundamentals



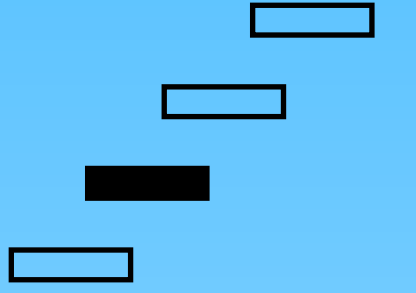
## Module 1: Key HVAC Principles

- Application of HVAC fundamentals for operating a plant
- Vapor compression cycle
- P-H diagram, COP and concept of “Lift”
- Fan curves & fan laws
- Pump curves & pump laws

## Module 2: Psychrometry

- Properties of air (Dry bulb and wet bulb temperatures, relative humidity, enthalpy, etc.)
- Reading & using a Psychrometric Chart
- Psychrometric calculations

# HVAC Training: Pharma HVAC



## Module 3: Pharma HVAC

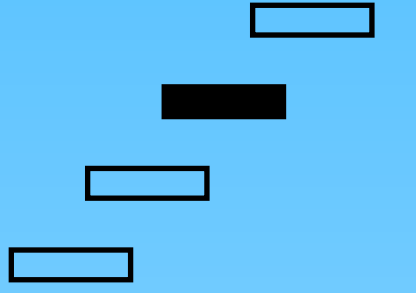
- Important user requirements
- Pharma design considerations and configurations for different applications
- Reviewing HVAC design, installation & commissioning as end-users
- Latest trends (including AI)

## Module 4: GMP Regulations & Standards

- EU GMP, WHO, FDA requirements
- ISO and ISPE guidelines
- ASHRAE and local codes



# HVAC Training: Troubleshooting



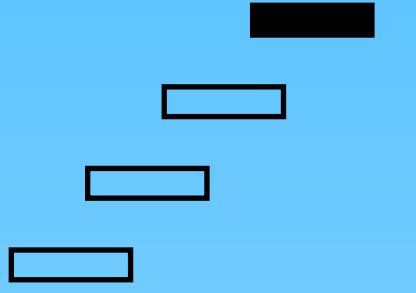
## Module 5: HVAC Troubleshooting Strategies

- Typical HVAC problems in biopharma plant
- Two types of problems – known and unknown causes
- Why jumping to solutions is easy but costly
- Systematic approach
  - Examine
  - Analyze (Five Why's, Fishbone)
  - solve

## Module 6: Troubleshooting with a Checklist

- Power of a checklist (WHO example)
- How to create a powerful checklist for troubleshooting
- Collaborative troubleshooting
- Preventing problems
- Case studies

# HVAC Training: Energy Saving



## Module 7: Energy Saving (Part 1)

- Drivers for saving energy
- Key terms: COP, kW/TR, EER & basic energy calculations
- ISO 14644-16 (energy efficiency in cleanrooms)
- Key HVAC-related strategies (cleanroom side)
  - Air Changes (ACH) reduction
  - Temperature and humidity set points
  - Night/weekend setback
  - Cleanroom tightness

## Module 8: Energy Saving (Part 2)

- Key HVAC-related strategies (plant side)
  - Fresh airflow reduction
  - High-efficiency equipment: Fans, motors
  - Tightness – ducts
  - Design parameters: Outdoor conditions, equipment selection, filter selection
  - VFD
  - Heat recovery, run around coil
- How
  - Energy management – a systematic approach, stakeholders, conflicting requirements (GMP, reliability vs. cost savings), risk-based approach
- Case study

# 04 Training Schedule

# Program (Online Training\*)

## Day 1: 17 Nov 2023 (Fri)

<b>Module 1:</b> HVAC Fundamentals	Morning session: 8:30-10:30 am
<b>Module 2:</b> Pyschrometry	Morning session: 10:45-12:00 pm
<b>Module 3:</b> Pharma HVAC	Afternoon session: 1:15-2:45 pm
<b>Module 4:</b> GMP Regulations & Standards	Afternoon session: 3:00-5:00 pm

## Day 2: 20 Nov 2023 (Mon)

<b>Module 5:</b> HVAC Troubleshooting Strategies	Morning session: 8:30-10:30 am
<b>Module 6:</b> Troubleshooting with a Checklist	Morning session: 10:45-12:00 pm
<b>Module 7:</b> Energy Saving (Part 1)	Afternoon session: 1:15-2:45 pm
<b>Module 8:</b> Energy Saving (Part 2)	Afternoon session: 3:00-5:00 pm

\* Zoom link will be provided

# 05 Trainer

# 05 Meet the Trainer

## Atul Mathur

- ★ Overall 30 years of experience in HVAC & last 15 years in pharma HVAC (design, commissioning, qualification and project management)
- ★ ACTA-certified trainer with over 15 years of training experience
- ★ Master's degree in engineering

For more information, please visit:

**<https://www.linkedin.com/in/atulmathurhello/> & <https://hvac-cq.com>**

# 06 Key Features & Benefits

## Features

- **Relevant & Practical:** Designed & delivered by a practitioner with decades of experience for other fellow practitioners
- **Interactive:** Highly engaging with questions, discussions, exercises and experience-sharing...it's not a boring slide show
- **Competency-based:** Every module starts with clear learning goals and ends with a small quiz...you'll need to be alert and engaged
- **High-quality:** Precise and high-quality content and training materials

## Benefits

By attending this 2-day training, you'll learn:

- HVAC fundamental concepts useful for routine operations;
- Different types of pharma HVAC designs and GMP regulations and international standards;
- Systematic approach to troubleshooting; and
- energy saving opportunities in pharma HVAC systems.

**Bottomline:** Back from the training, you'll do your job with greater confidence and competence.

# 07 Fee

- Standard fee: **SGD 880/pax**
  - Discounted fee - early registration by 31 Oct: **SGD 680/pax**
  - Discounted fee - early registration by 31 Oct and min. 2 pax: **SGD 480/pax**

## How to register (1-2-3)

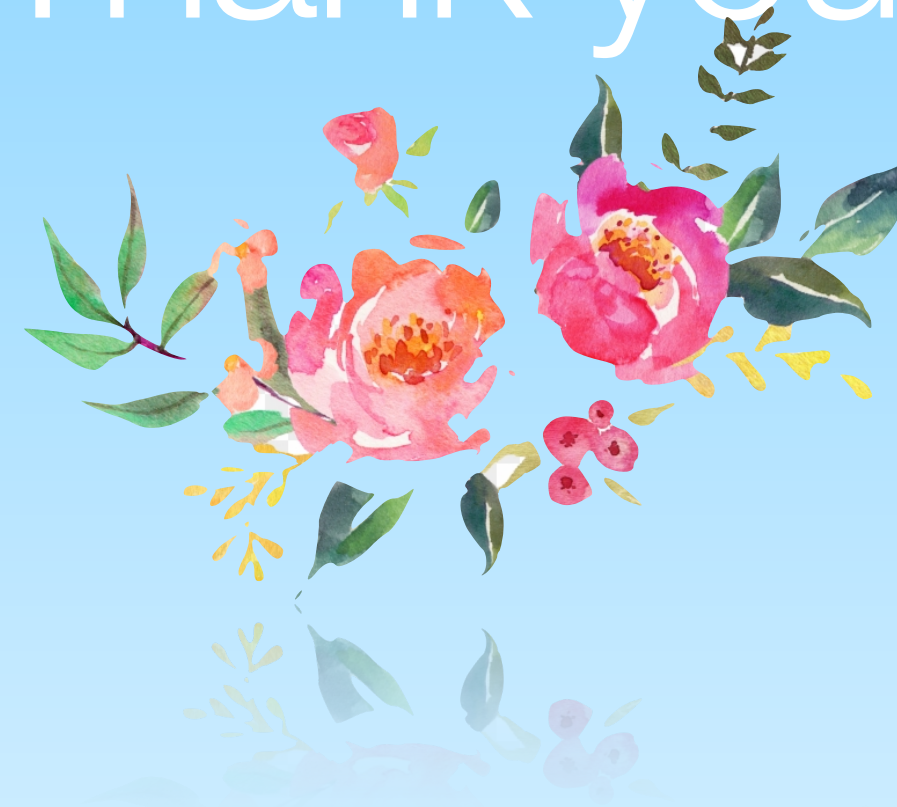
1. To register, simply send an email to: [atul@atulmathur.com](mailto:atul@atulmathur.com) with the following details
  - (i) Full Name, (ii) designation, (iii) company name, and (iv) number of participants (in case of group registration)
2. You'll receive an acknowledgment with payment details
3. Make the payment to confirm your registration



*Anyone who stops learning is old, whether at twenty or eighty. Anyone who keeps learning stays young.*

Henry Ford

Thank you!



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