📄 LESSON PACKET

Metering Devices – Operation & System Control

TMM Academics – Sealed System Training

🔹 Lesson Overview

This lesson explains how metering devices regulate refrigerant flow between the high-pressure and low-pressure sides of a sealed system. Understanding how these devices create a pressure drop and control refrigerant flow is essential for proper system operation and accurate diagnostics.

🔹 1. Purpose of a Metering Device

The metering device is responsible for:

- Controlling the flow of refrigerant into the evaporator
- Creating a pressure drop from high side to low side
- Regulating the amount of refrigerant entering the evaporator

👉 Without a metering device, the system cannot separate high and low pressure.

🔹 2. Pressure Drop Function

The metering device is the dividing point between:

- **High Pressure Side (Condenser side)**
- **Low Pressure Side (Evaporator side)**

As refrigerant passes through the metering device:

- Pressure drops suddenly
- Temperature drops with it

- Liquid refrigerant begins to boil

👉 This is where the cooling process begins

🔹 3. Types of Metering Devices

Common types include:

- Capillary Tube (most common in household refrigerators)
- Fixed Orifice
- Thermostatic Expansion Valve (TXV)
- Electronic Expansion Valve (EEV)

🔹 Capillary Tube (Most Common)

- Very small diameter tubing
- Fixed restriction
- No moving parts
- Flow is controlled by length and internal diameter

👉 Once installed, it cannot adjust to changing conditions

🔹 4. Refrigerant Condition at Metering Device

At the inlet (before metering device):

- High pressure
- Liquid refrigerant
- Subcooled or saturated liquid

At the outlet (after metering device):

- Low pressure
- Mixture of liquid and vapor
- Begins boiling immediately

👉 This is called **flash gas formation**

🔹 5. Relationship to Evaporator

The metering device feeds refrigerant into the evaporator.

For proper operation:

- Flow must be balanced
- Too much flow → flooding
- Too little flow → starvation

👉 The evaporator depends on correct metering device operation

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🔹 6. System Balance

The system must maintain balance between:

- Compressor (pumping)
- Metering device (restriction)

If balance is correct:

- Proper pressures
- Proper cooling

If balance is off:

- Incorrect pressures
- Poor performance

🔹 7. Restrictions (Very Important)

The most common failure:

👉 **Restriction at or near the metering device**

Causes:

- Moisture
- Debris
- Oil contamination

Common location:

👉 First few inches of capillary tube

Symptoms:

- Low suction pressure
- Frost at restriction point
- Reduced cooling

🔹 8. Overfeeding vs Underfeeding

Overfeeding:

- Too much refrigerant entering evaporator
- Floodback risk
- Compressor damage possible

Underfeeding:

- Not enough refrigerant
- Evaporator not fully active
- Poor cooling

🔹 9. Field Application

When diagnosing a system:

Ask:

- Is refrigerant flowing properly?
- Is there a restriction?
- Are pressures normal?
- Is evaporator being fed correctly?

👉 Metering device problems often look like:

- Low charge
- Inefficient compressor

🔹 10. Service Considerations

When working on a restricted system:

- Replace filter drier
- Inspect capillary tube
- Avoid cutting excessive length
- Maintain original design specifications

⚠️ **Important:**

Capillary tube length is critical

👉 Too short = improper flow
👉 System performance reduced

🔹 11. Diagnostic Thinking

Always connect:

Pressure → Temperature → Flow

Ask:

- What is the pressure before and after the metering device?
- What should the temperature be at that pressure?
- Is refrigerant properly changing state?

👉 This is how you identify metering issues correctly

📝 Review Questions

Multiple Choice

1. What is the primary function of a metering device?
   A. Increase pressure
   B. Control refrigerant flow
   C. Cool the compressor
   D. Store refrigerant

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2. What happens to refrigerant pressure at the metering device?
   A. Increases
   B. Decreases

C. Stays the same
D. Stops

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3. What is the most common metering device in household refrigerators?
   A. TXV
   B. EEV
   C. Capillary tube
   D. Solenoid valve

Short Answer

4. Why is a pressure drop necessary at the metering device?

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5. What is a common location for a restriction?

Scenario-Based

6. A system has low suction pressure and poor cooling.
   What is a possible cause?

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7. A system has correct charge but the evaporator is not fully active.
   What could be happening?

✅ Answer Key

1. B – Control refrigerant flow
2. B – Decreases
3. C – Capillary tube

4. To allow refrigerant to boil at a lower temperature and absorb heat

5. At the capillary tube or near the metering device

6. Restriction or underfeeding condition

7. Metering device not feeding enough refrigerant