SNS COLLEGE OF ALLIED HEALTH SCIENCE

Affiliated to The Tamil Nadu Dr MGR Medical University, Chennai

DEPARTMENT OF OPERATION THEATRE AND ANESTHESIA TECHNOLOGY – II Year

COURSE NAME: PRINCIPLES OF ANESTHESIA - 1

UNIT 1 - ANAESTHESIA MACHINE & MEDICAL GAS SUPPLY

TOPIC : Anesthesia Machine

FACULTY NAME: Ms. Shanmuga Priya

ANESTHESIA MACHINE

- An anesthesia machine is a medical device used to generate and mix a fresh gas flow of medical gases (e.g., O_2, N_2O) and inhalational anesthetic agents for inducing and maintaining anesthesia.
- It integrates with ventilators, breathing systems, suction equipment, and monitoring devices for comprehensive patient care.
- Invented by Edmund Gaskin Boyle in 1917, known as Boyle's anesthesia machine.
- Shifted from portable setups to stationary units due to bulky cylinder storage and complex systems.

Major Components

- High Pressure System
- Intermediate Pressure System
- Low Pressure System
- Breathing System
- Ventilator
- Scavenging System
- Monitoring Devices

High Pressure System

- **Gas Cylinders**: Store high-pressure gases (e.g., O_2 at 2200 psig, N_2O at 745 psig); color-coded for safety.
- **Yoke Assembly**: Secures cylinders with pin-index safety system to prevent wrong connections.
- **Check Valves**: Prevent backflow of gases.
- **Pressure Gauges**: Indicate cylinder pressure levels.
- **Pressure Regulators**: Reduce pressure to 45-50 psig for downstream use.

Intermediate Pressure System

- **Pipeline Inlets**: Connect to central gas supply (50 psig) with filters and check valves.
- **Master Switch**: Controls gas flow activation.
- **Oxygen Pressure Failure Devices**: Alarms and stops other gases if O_2 pressure drops.
- **Second Stage Regulators**: Fine-tune pressure to intermediate levels.
- **Flush Valve**: Delivers 50 L/min O_2 in emergencies.

Low Pressure System

- **Flow Control Valves**: Adjust gas flow rates.
- **Flowmeters (Rotameters)**: Measure and display gas flow (e.g., 0-15 L/min).
- **Hypoxia Prevention Safety Devices**: Ensure minimum 25% O_2 in mixture.
- **Unidirectional Check Valves**: Prevent reverse gas flow.
- **Vaporizers**: Deliver precise anesthetic vapors (e.g., sevoflurane), temperature-compensated.
- **Common Gas Outlet**: Connects to breathing circuit.

Breathing Circuits

- **Absorber Assembly**: Removes CO_2 using soda lime.
- **Unidirectional Valves**: Ensure one-way gas flow to patient.
- **Adjustable Pressure Limiting Valve**: Releases excess pressure.
- **Reservoir Bag**: Allows manual ventilation and pressure monitoring.
- **Hoses**: Connect components to patient circuit.
- **Y Piece**: Splits gas flow to inspiratory and expiratory limbs.

Ventilator

- **Bellows Assembly**: Drives gas into patient lungs.
- **Controls**: Adjust tidal volume, respiratory rate, and pressure.
- **Alarms**: Alert for high pressure or disconnection.

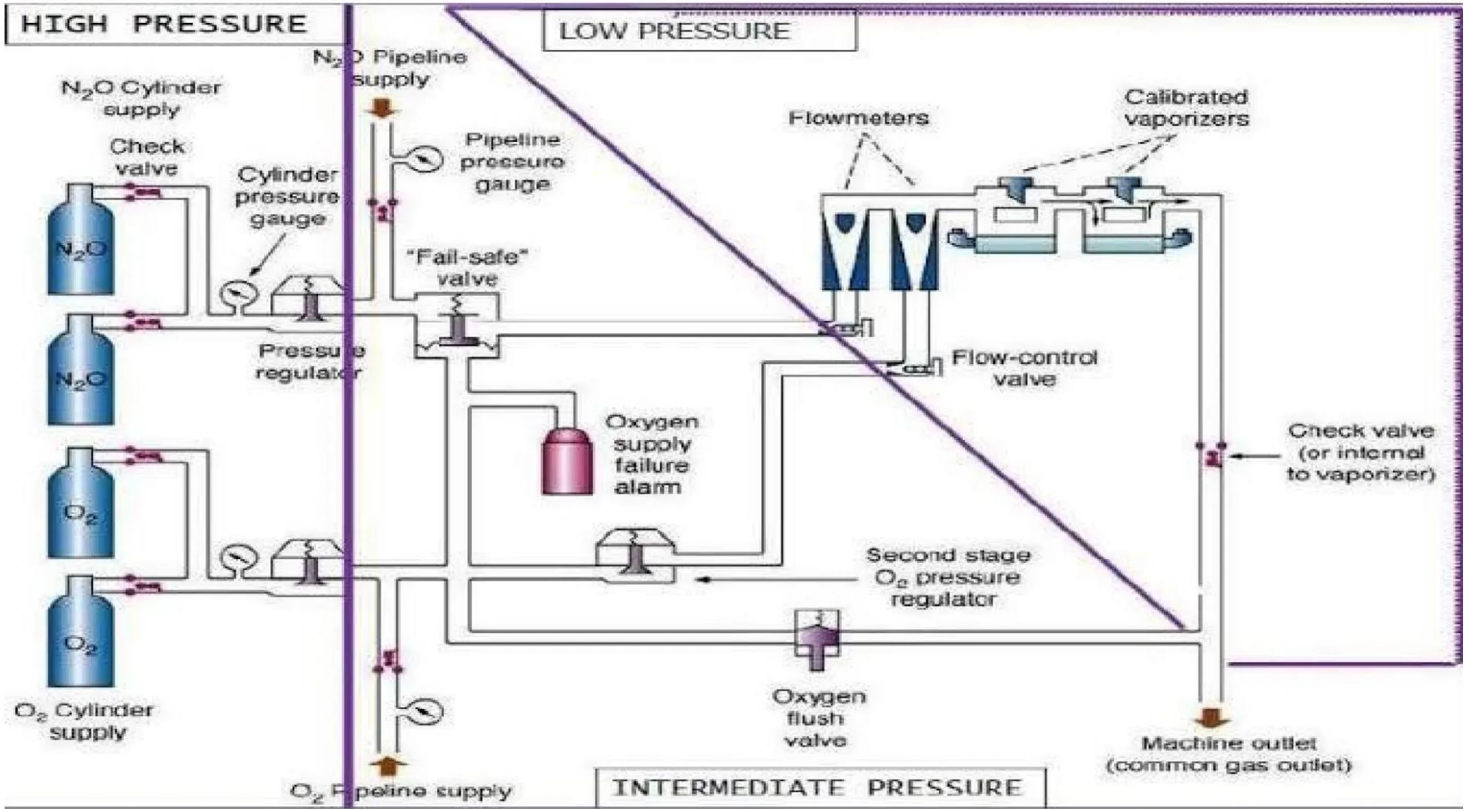
Scavenging System

- **Collection System**: Captures excess anesthetic gases.
- **Transfer Tubing**: Transports gases to disposal.
- **Gas Disposal Tubing**: Connects to exhaust system.
- **Gas Disposal Assembly**: Safely vents gases outside.

Monitoring Devices

- **Oxygen Analyzer**: Measures O_2 concentration.
- **Pressure Gauges**: Monitor circuit pressure.
- **Volume Monitors**: Track delivered tidal volume.
- **Respiratory Rate Monitors**: Display breathing frequency.
- **Capnograph**: Measures CO_2 levels.
- **Pulse Oximeter**: Assesses oxygen saturation.

Anesthesia Machine



In-Class Assessment

- **Case-Based Question (10 points)**: In the scenario, identify the faulty system and recommend two precautions. Justify with functions.
- **Short Answer (5 points)**: List three parts each from high and low-pressure systems.
- **Group Discussion (5 points)**: Ideate one solution for intermediate-pressure safety. Present its benefit.
- **Multiple Choice (5 points)**: What reduces cylinder pressure in high system? a) Flowmeter b) Regulator c) Vaporizer d) Pipeline
- **Reflection (5 points)**: Write a brief paragraph on how DT improves anesthesia machine setup.
- **Total**: 30 points *Submit written answers and discuss group activity in class.*

Summary

- Anesthesia machine is essential for safe anesthesia delivery.
- Understand the three pressure systems and their parts: High (cylinders, regulators), Intermediate (pipelines, alarms), Low (flowmeters, vaporizers).
- Regular checks and maintenance are crucial for reliability.
- Safety features prevent mishaps during use.

References

- **Book**: Dorsch JA, Dorsch SE. (2020). *Understanding Anesthesia Equipment*. 6th ed. Wolters Kluwer.
- **Website**: American Society of Anesthesiologists. Anesthesia Machine Checkout Recommendations. https://www.asahq.org/standards-and-practice-parameters/statements/anesthesia-machine-checkout-recommendations (Accessed October 21, 2025).
- **Journal**: Subrahmanyam M, Mohan S. (2013). Safety Features in Anaesthesia Machine. *Indian Journal of Anaesthesia*, 57(5), 472–480. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3821260/ (Accessed October 21, 2025).

THANK YOU