



# Environmental Control of the Mines Atmosphere

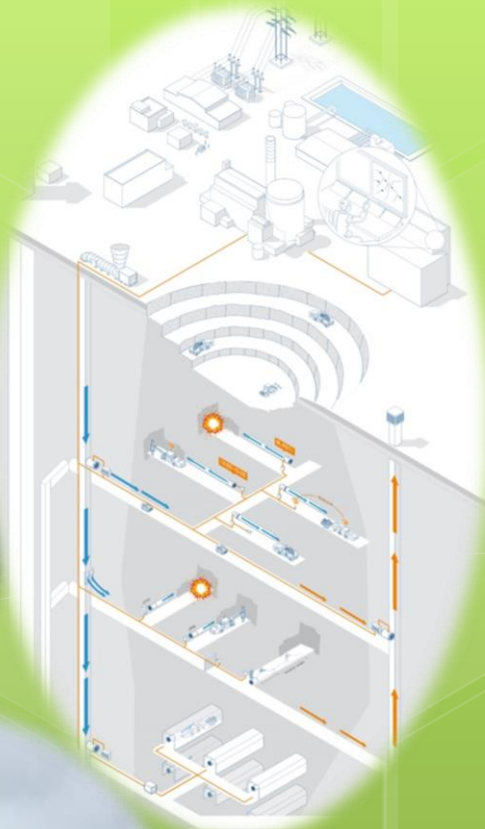
College of Petroleum & Mining Eng.

Mining Engineering Dept.

4<sup>th</sup> Class

Lecture No. 1 – Chapter 1

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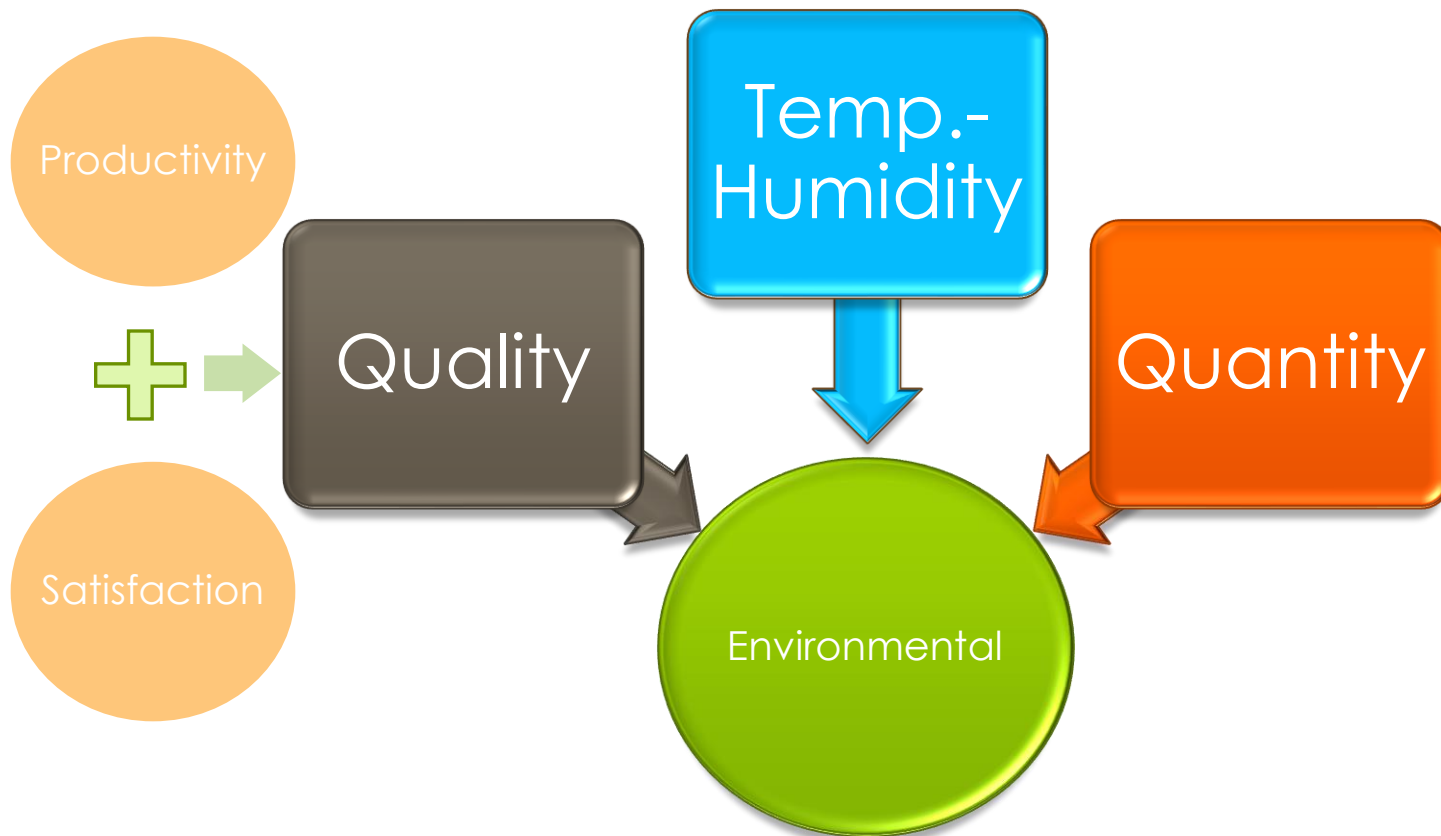
# Overview

- Purpose and Importance
- Historical Perspectives and Natural Constraints
- Control Processes
- Coordination of Mining and Ventilation Systems
- Accuracy of Calculations
- Mathematical Units

# Purpose and Importance

- Definition of Environmental
- Definition of Safety
- Definition of Ventilation

# Purpose and Importance



# Historical Perspectives and Natural Constraints



- When Ventilation Machines are needed?
- If a shaft is very deep and no tunnel reaches to it, or no drift from another shaft connects with it, or when a tunnel is of great length and no shaft reaches to it, then the air does not replenish itself.
- In such a case it weighs heavily on the miners, causing them to breathe with difficulty, and sometimes they are even suffocated, and burning lamps are also extinguished.

# Historical Perspectives and Natural Constraints

- Technology has vastly improved mine ventilation, although environmental challenges underground still abound.
- Depth, the most serious natural constraint, sets the ultimate limit, specifically through rock pressure and rock temperature.
- To preserve mine atmospheric quality under these intense heat conditions, ventilation at great depths must be supplemented by air conditioning A/C.

# Control Processes

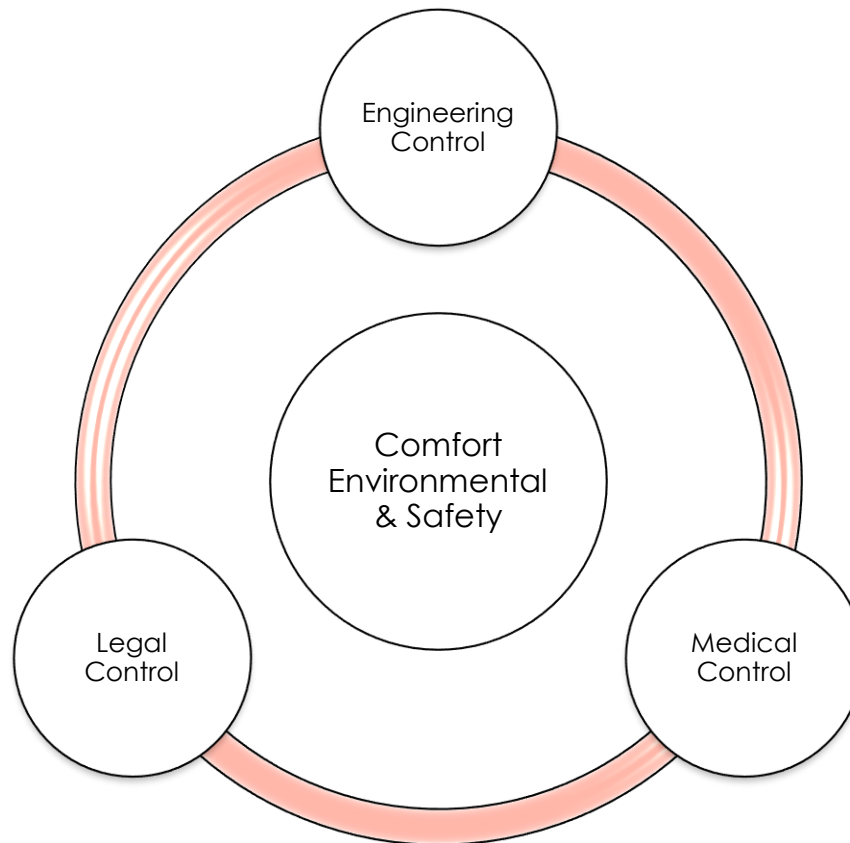
- 1. **Quality control** (purifying air and removing contaminants)
  - a. Gas control—vapors and gaseous matter, including radiation
  - b. Dust control—particulate matter
  
- 2. **Quantity control** (regulating magnitude and direction of airflow)
  - a. Ventilation
  - b. Auxiliary or face ventilation
  - c. Local exhaust
  
- 3. **Temperature-humidity control** (controlling latent and sensible heat)
  - a. Cooling
  - b. Heating
  - c. Humidification
  - d. Dehumidification

# Control Processes

- Control processes may be applied individually or jointly.
- If the objective is total air conditioning of the mine, then all three goals must be met, and multiple processes may be applied simultaneously.



# Control Processes

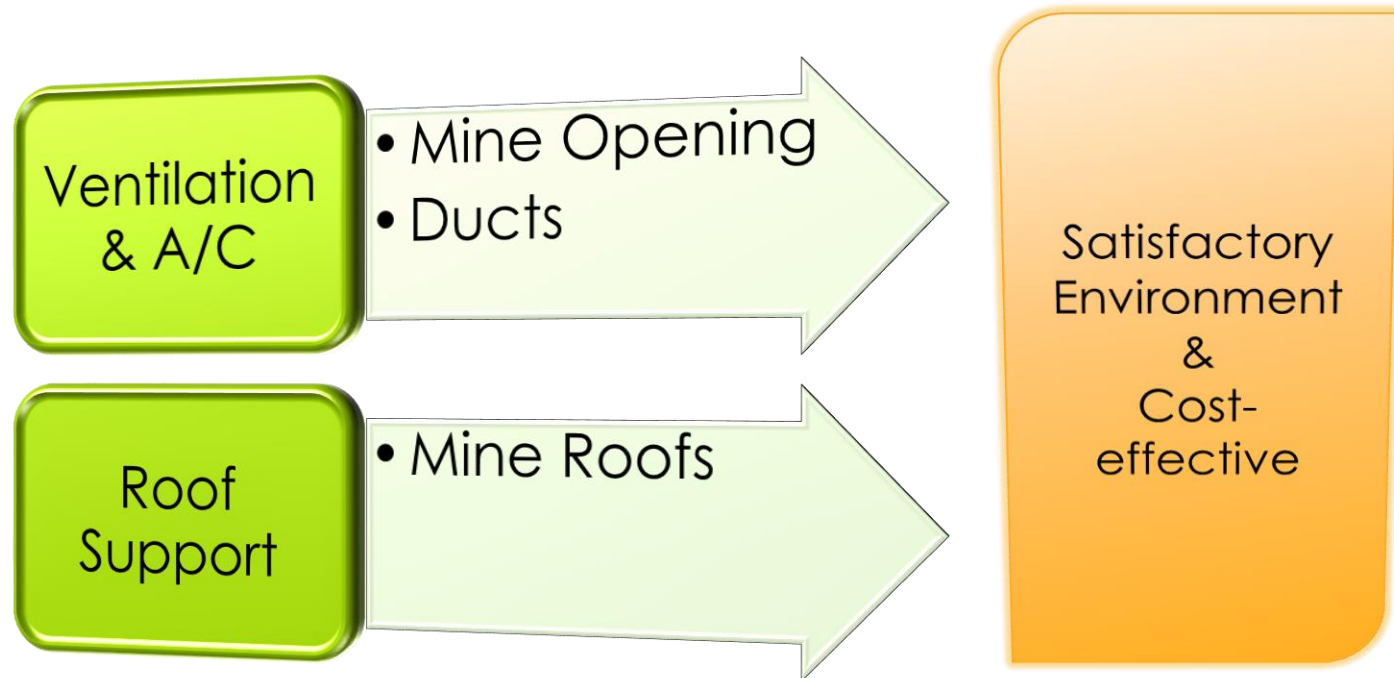


# Control Processes

- Engineering Control Principle
- 1. Prevention or avoidance
- 2. Removal or elimination
- 3. Suppression or absorption
- 4. Containment or isolation
- 5. Dilution or reduction

# Coordination of Mining and Ventilation Systems

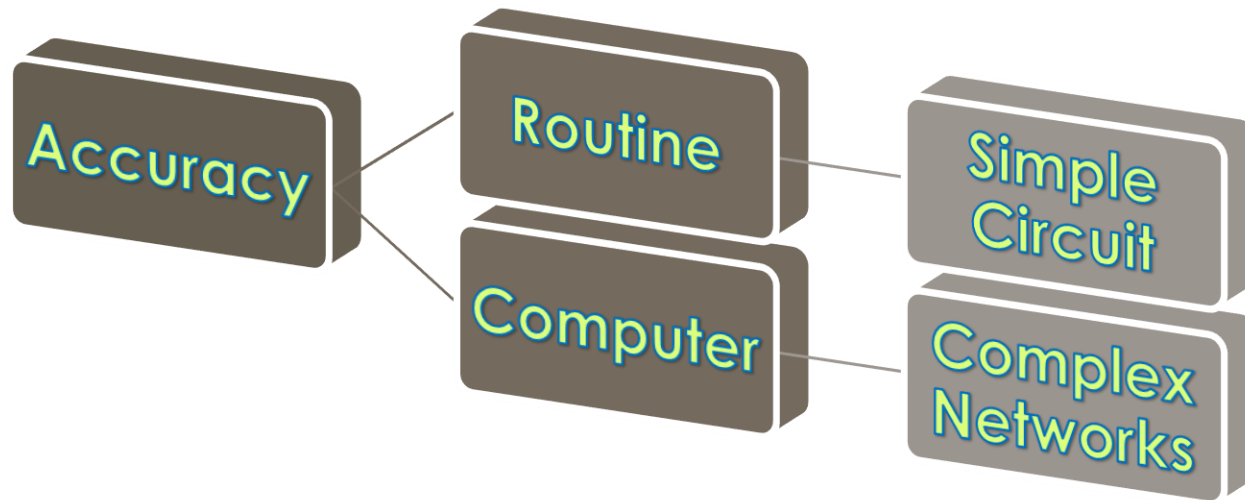
- The most vital environmental control measures are:



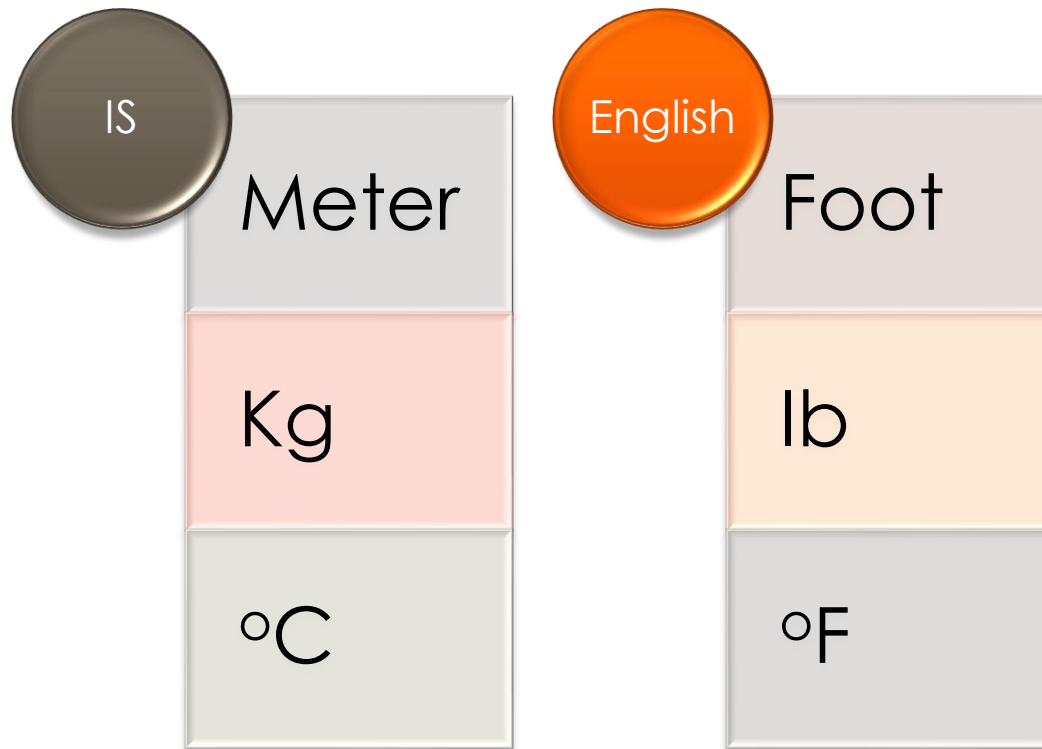
# Coordination of Mining and Ventilation Systems

- 1. The high-speed, electronic *digital computer*, permitting advanced solutions to ventilation circuits and networks heretofore unsolvable.
- 2. The *systems approach*, which optimizes complex industrial operations, permitting personnel, materials, and methods to be coordinated in the most efficient way.
- 3. Extensive federal *legislation*, embodying a strict code of regulations to improve the safety of mining operations.
- 4. The advent of *socio-engineering*, the applying of technology with full consideration of the social, political, economic, and environmental consequences as well as the technical benefits

# Accuracy of Calculations



# Mathematical Units



**END OF CH.-1**