SCIENCE AND TECHNOLOGY CAREER PATHWAYS

SEMESTER II

University May 8, 1945 Guelma

2025

Chapter 1

Industrial Hygiene & Safety (HSI) and Mining Engineering

Course Outline

- Definition and various aspects of the HSE field
- Business sectors
- The Role of HSE Specialists.
- Mining Engineering
- Career prospects

Introduction

Imagine a world without mining engineers. No smartphones, no cars, no electricity—because every piece of technology relies on minerals extracted from the Earth. Now imagine a world without industrial safety experts. Factories collapse, workers get injured, and environments are destroyed. Today, we'll explore two fields that silently shape our modern lives: ***Industrial Hygiene and Safety (HSI)*** *and* ***Mining Engineering****.*

Hygiene, Safety and Environment (HSE)

- Health, Safety, and Environment (HSE) is a domain of expertise that encompasses everything related to health and safety in the workplace.
- HSE is the science of anticipating, recognizing, evaluating, and controlling workplace hazards to protect people, property, and the environment.
- It is a domain of technical expertise that controls aspects related to occupational risks within the company. In this capacity, the HSE officer is responsible for:
  - Ensuring the safety of personnel,
  - Providing training in prevention measures,
  - Ensuring compliance with standards,
  - And ensuring the reliability of installations within the company.

Job Description:

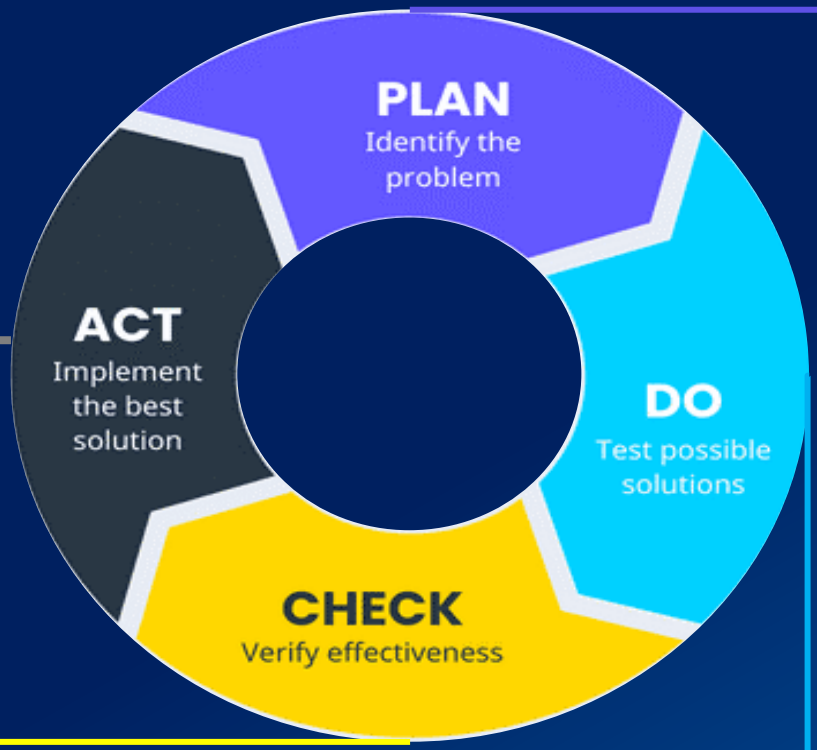
- The HSE manager is a risk manager because the prevention of breakdowns and bodily harm has become a significant issue for companies and insurance companies (See the disasters of Chernobyl, Seveso, AZF...)
- The hygiene and safety function ensures the proper functioning of the company by reducing human and material damage. It primarily addresses:
  - Workplace accidents,
  - Occupational diseases,
  - And environmental protection.
- This job requires good physical resilience, initiative, and observation.

HSE Safety Management Plan

- To manage workplace safety effectively, an HSE professional should follow a continuous cycle using the Plan-Do-Check-Act (PDCA) framework.

• **Review and Improve:** Analyze monitoring results to identify areas for improvement and update safety protocols accordingly.

• **Monitor and Evaluate:** Track the effectiveness of implemented measures. Use feedback to assess performance against safety objectives.



• **Investigate and Understand:** Identify hazards and risks through thorough investigation and observation.
• **Analyze and Assess Risks:** Evaluate the identified risks, considering their potential impact on the workplace.
• **Develop Solutions:** Propose and implement practical solutions to address the risks and prevent accidents.

• **Execute Action Plans:** Execute the action plans, ensuring the necessary resources and strategies are in place for effective resolution.
• **Communicate and Train:** Inform stakeholders about safety procedures and updates. Provide training to ensure compliance and awareness.

Career prospects

- Professionals in hygiene and safety work in:

- **Engineering offices**

Sonelgaz: Operates large power plants, requiring strong safety protocols in energy production.

- **Inspection agencies,**

Algerian Bureau of Control: Ensures compliance with safety and environmental regulations across industries.

- **Local and regional authorities,**

Ministry of Labor: Oversees health and safety regulations for workplaces.

- **Insurance companies,**

CNAS: Provides social insurance and oversees workplace safety regulations.

- **Firefighting services,**

Civil Protection: Provides fire fighting, disaster response, and ensures safety during high-risk situations.

- **Classified installations**

Sonatrach: Operates refineries and petrochemical plants, requiring strict safety protocols.

Health, Safety, and Environment Manager

- The Health, Safety, and Environment manager is therefore the person responsible for all preventative measures. They ensure the prevention of industrial risks, enforce hygiene and working conditions, and assist in production without pollution.

Health, Safety, and Environment Manager

- Whether in a public enterprise (hospital, classified installations department, local authority…) or private (chemical industry, metallurgy, automotive, construction…), the Health, Safety, and Environment Manager:

  - Advises and assists the management in the development and organization of its safety policy (occupational safety, working conditions).
  - Ensures the implementation, and monitoring,
  - Establishes prevention programs to reduce the number of incidents and their costs (work accidents, occupational diseases).
  - Directs and controls all prevention actions against risks.

Occupational risk

- ✓ The employee and their company
  - The company implements all conditions that allow for the preservation of the physical and mental integrity of its employees and to limit the consequences on the individual of a workplace accident or occupational disease. The prevention approach is a factor in the personal and professional development of the company's employees and a guarantee of the quality of social dialogue.

The main risks

- There are various types of risks related to the professional environment:
  - ✓ ***Workplace accident:*** defined by the fact that the employee is under the responsibility of their employer, and commuting accident occurs when it happens between the employee's home and their workplace (or between their workplace and where they have their meals).
  - ✓ ***Occupational disease:*** the consequence of more or less prolonged exposure to a physical, biological, or chemical risk (such as dust, toxic fumes, noise, heat, vibrations) that exists during the usual practice of the profession.
  - ✓ ***Psychosocial risks:*** refer to the potential for harm or negative impacts on an individual's mental health and well-being due to the work environment

The cost of the HSE policy

- Mainly includes the contributions that the company pays to the Retirement and Occupational Health Insurance Fund and the cost of protective equipment. These contributions vary according to its size and facilities, so they will range from 1 to 10% of the payroll. The main mission of the insurance fund is to collect employee and employer contributions intended to finance the general Social Security scheme, as well as other organizations or institutions.

The cost of the HSE policy

- ***Social Security*** includes the sickness branch, the old age branch, the family branch, and the recovery branch. We also find the cost of protection: the labor code provides that "personal Protective equipment and work clothing (...) must be provided free of charge by the employer who ensures their proper functioning and satisfactory hygienic condition."

Legal Tools

- The HSE legal tools encompass a variety of laws, and regulations aimed at promoting health, safety, and environmental protection in the workplace.
- These legal instruments serve as a framework for organizations to implement effective HSE management systems and practices.
- Some key components of HSE legal tools include:

✓ ***Occupational Health and Safety Legislation:*** these laws and regulations set forth requirements for employers to provide a safe and healthy work environment for their employees. They address various aspects such as hazard identification, risk assessment, safety training, emergency preparedness, and the provision of personal protective equipment (PPE).

Legal Tools

- ✓ ***Environmental Protection Laws:*** Environmental regulations aim to minimize the impact of industrial activities on the environment by controlling pollution, conserving natural resources, and promoting sustainable practices.
- ✓ ***Workers' Compensation Laws:*** These laws establish a system for compensating workers who suffer injuries or illnesses arising from their employment. They provide financial benefits for medical expenses, lost wages, and disability resulting from work-related incidents.
- ✓ ***Health and Safety Standards:*** Standards developed by government agencies or industry organizations provide detailed guidelines and best practices for specific aspects of health, safety, and environmental management.

Mining Engineering

- A mine is a branch of engineering that focuses on the extraction, processing, and management of mineral resources from the Earth's crust (such as gold, coal, copper, diamonds, iron, salt, uranium, etc.).
- Mining engineers are responsible for designing and implementing efficient and safe mining operations, including the planning and development of mines, the design of mining equipment and processes, and the management of environmental impacts associated with mining activities.
- Key aspects of mining engineering include:

  ✓ ***Exploration:*** Identifying and assessing mineral deposits through geological surveys, sampling, and testing to determine their economic viability.

  ✓ ***Mine Design and Planning:*** Developing plans for the construction of mines, including the design of mine tunnels, and access roads, as well as the selection of mining methods and equipment.

Mining Engineering

- ***Mineral Extraction:*** Overseeing the extraction of minerals from the Earth's crust using various methods such as underground mining, open-pit mining, and surface mining.
- ***Mineral Processing:*** Designing and implementing processes to extract and refine valuable minerals from ore, including crushing, grinding, concentration, and smelting.
- ***Safety and Risk Management:*** Ensuring the safety of mining personnel and minimizing risks associated with mining activities, including the prevention of accidents, the management of hazards such as rockfalls and gas emissions, and compliance with health and safety regulations.

Training in mining engineering

- The training in the field of mining engineering covers various aspects such as:
  - Fundamental principles of mining engineering
  - Geology and ore exploration techniques
  - Mine planning and design
  - Mineral extraction methods and technologies
  - Environmental management in mining
  - Health and safety regulations in mining operations
  - Mine economics and project management

Career prospects

- Career prospects in mining engineering are diverse and promising, offering opportunities in various sectors and roles within the mining industry both at the national and international levels. Some common career paths for mining engineers include:
  - Civil engineering, public works and public administrations (Ministries, Regulatory Agencies)
  - Mining Operations
  - Mine Planning and Design
  - Mineral Exploration
  - Consulting
  - Research and Development