MCN-201:
SUSTAINABLE ENGINEERING

Module 3

Module 3

Environmental management standards: ISO 14001:2015 frame work and benefits

Scope and goal of Life Cycle Analysis(LCA),

Circular economy,

Bio-mimicking,

Environment Impact Assessment (EIA),

Industrial ecology and industrial symbiosis.

1. Environmental management standards: ISO 14001:2015 frame work and benefits

- ★ The international standard ISO 14001 provides the standards for an efficient environmental management system (EMS).
- ★ Rather than establishing environmental performance requirements, it gives a framework for an organization to follow.
- ★ An environmental management system is defined by the International Organization for Standardization (ISO) as "a component of a management system used to manage environmental elements, meet compliance duties, and address risks and opportunities."
- ★ The ISO 14001 framework can be used in connection with a plan-do-check-act (PDCA) strategy to continuous improvement.

ISO 14001:2015

★ Any organization that wishes to build, upgrade, or maintain an environmental management system in accordance with its specified environmental policy and standards should adopt ISO 14001:2015.

★ ISO 14001:2015 addresses the following environmental management system topics:

- Context of the organization
- Leadership
- Planning
- Support
- Operation
- Performance evaluation
- Improvement

ISO 14001 Environmental Management Systems (EMS) Framework

10 major areas of impact of the 2015 revision:

1. Expansion in EMS coverage and scope
2. Required interactions with external parties
3. New requirements for leadership engagement
4. Expanded legal compliance requirements
5. Need for risk-based planning and controls
6. New documentation requirements
7. Expanded operational control requirements
8. Changes in competence and awareness requirements
9. Impacts on the internal audit program
10. Increased certification costs

THE BENEFITS OF ISO 14001:2015

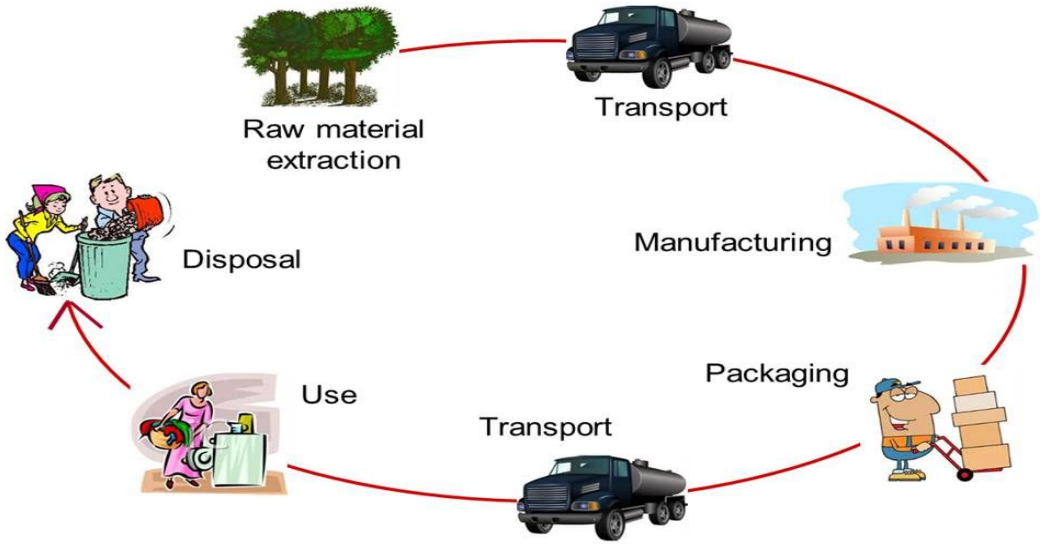
The use of ISO 14001:2015 has numerous advantages for organizations using environmental management systems.

1. Improve resource efficiency
2. Reduce waste
3. Drive down costs
4. Provide assurance that environmental impact is being measured
5. Gain competitive advantage in supply chain design
6. Increase new business opportunities
7. Meet legal obligations
8. Increase stakeholder and customer trust
9. Improve overall environmental impact
10. Manage environmental obligations with consistency

2. Scope and goal of Life Cycle Analysis(LCA)

★ Life cycle assessment (LCA) is a tool that helps decision makers and companies make decisions by looking at the effects of a product's life and processes from the time it is made until it is thrown away.

★ This includes the extraction of resources, production, manufacture, transportation, use, and disposal.



Life cycle assessment consists of four phases:

1. Goal and scope definition
2. Life cycle inventory
3. Life cycle impact assessment
4. Interpretation

Goal and Scope Definition

★ 1st phase includes the goal and scope of the study and defines the system under study, in terms of its functional unit, system boundaries, hypotheses and data requirement.

Life Cycle Inventory

- ★ 2nd phase is a life cycle inventory (LCI) which involves data collection and modeling of the product system.
- ★ In this phase, information about environmental inputs (raw materials, chemicals, energy, etc.) and outputs (air emissions, water emissions and waste) from all parts of the product system is gathered.

Life Cycle Impact Assessment

- ★ Life cycle impact assessment (LCIA) evaluates the potential environmental impacts (such as global warming, ozone depletion, smog, acidification, eutrophication, ecotoxicity, etc.) associated with identified inputs and releases.

★ There are mandatory and optional elements in the LCIA phase. Mandatory elements include

i) the selection of relevant environmental impact categories (selection)

ii) the assignment of LCI results to the selected impact categories (classification)

iii) the calculation of environmental impact scores (characterization)

Interpretation

★ Interpretation leads to the conclusion whether the goal and scope was met.
★ Interpretation of results helps to make an informed decision about the environmental impacts of products and processes.
★ Conclusions, limitations and recommendations are given in this phase.