

Subject - Environmental Protection and Management

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Topic - Waste Audits and Pollution Prevention opportunities in Textile , Sugar, Pulp & Paper, Electroplating, , Tanning industry, Dairy, Cement, Chemical industries, etc. Trans boundary movement, disposal, procedures, of hazardous wastes.

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Waste Audits and Pollution Prevention Opportunities



Definition of Waste Audits

- Evaluates waste management
- Reduces costs
- Ensures compliance



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Importance of Pollution Prevention

- Minimizes environmental harm
- Conserves resources
- Enhances public image



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Overview of Industries Covered

- Textile Industry
- Sugar Industry
- Pulp and Paper Industry
- Electroplating Industry
- Tanning Industry
- Dairy Industry
- Cement Industry
- Chemical Industry



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Waste Audits in the Textile Industry



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- **Overview of Textile Waste**
 - **Types:** Water discharge, chemical runoff, energy waste.
 - **Impact:** Pollutes water bodies, depletes oxygen, harms soil productivity.
- **Waste Audit Procedures**
 - **Data:** Gather waste data from processes like dyeing, sizing, and bleaching.
 - **Analysis:** Evaluate waste composition and identify inefficiencies.



Waste Audits in the Textile Industry

- **Pollution Prevention Opportunities**
 - **Water:** Reduce and recycle water in processes like dyeing and washing.
 - **Chemicals:** Replace toxic substances with eco-friendly alternatives.
 - **Practices:** Implement air dyeing, reuse treated effluents, and adopt best practices.



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Waste Audits in the Sugar Industry



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- **Overview of Sugar Waste**
 - **Waste types: Water, effluents, sludge**
 - **Environmental impact: Pollution, soil degradation**
- **Waste Audit Procedures**
 - **Monitoring: Freshwater usage tracking**
 - **Effluents: Analyzing waste generation patterns**



Waste Audits in the Sugar Industry

- **Pollution Prevention Opportunities**
 - **Water recycling: Effective reuse methods**
 - **Waste minimization: Strategic reduction techniques**
 - **Energy recovery: Utilize process by-products**



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Overview of Pulp & Paper Industry Waste

- **Types of Waste Generated**
 - **Wastewater:** Washing, pulping, bleaching.
 - **Solid Waste:** Handling, screening, sludge.
 - **Air Emissions:** Sulfur, SO₂, NO_x.
- **Environmental Impact**
 - **Water:** Pollution.
 - **Soil:** Contamination.
 - **Air:** Degradation.



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Waste Audit Procedures

- **Wastewater Treatment Analysis**
 - **Primary:** Clarifiers.
 - **Biological:** Aeration, sludge.
 - **Segregation:** Targeted.
- **Solid Waste Management**
 - **Reuse:** Recycling.
 - **Sludge:** Dewatering.



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Pollution Prevention Opportunities

- **Process Optimization**
 - **Water:** Recycling.
 - **Bleaching:** Recirculation.
 - **Housekeeping:** Efficient.
- **Chemical Recovery Techniques**
 - **Black Liquor:** Recovery.
 - **Relime:** Reuse.
 - **Lime:** Optimization.



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Pollution Prevention Opportunities

- **Use of Alternative Raw Materials**
 - **Bagasse:** Renewable.
 - **Enzymes:** Biodegradable.
 - **Recycling:** Fibers.



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Waste Audits in the Electroplating Industry



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- **Overview of Electroplating Industry Waste**
 - **Types:** Cyanide, chromium, cadmium, solvents, sludges.
 - **Impact:** Groundwater, air, and soil contamination.
- **Waste Audit Procedures**
 - **Chemical Usage:** Evaluate inefficiencies.
 - **Wastewater:** Analyze pollutants.
- **Pollution Prevention Opportunities**
 - **Process Modification:** Optimize systems.
 - **Recovery & Recycling:** Reuse chemicals.
 - **Non-toxic Alternatives:** Safer substitutes.



Overview of Tanning Industry Waste

- **Types of Waste Generated**

- **Liquid Waste:** Wastewater containing high levels of organic and inorganic contaminants.
- **Solid Waste:** Fleshings, trimmings, and shavings.
- **Gaseous Emissions:** Volatile organic compounds (VOCs) and odoriferous gases

- **Environmental Impact**

- **Water Pollution:** Discharge of untreated or poorly treated effluent.
- **Soil Contamination:** Improper disposal of solid waste.
- **Air Pollution:** Emission of VOCs and malodorous gases.
- **Biodiversity Loss:** Impact on aquatic and terrestrial ecosystems.



Waste Audit Procedures

- **Monitoring Water and Chemical Usage**
 - **Water Usage**
 - Measure water input and effluent output.
 - Optimize water recycling and reuse.
 - **Chemical Usage**
 - Maintain a detailed inventory of chemicals.
 - Substitute hazardous chemicals with eco-friendly alternatives.
- **Solid Waste Management**
 - **Segregation:** Separate biodegradable, recyclable, and hazardous waste.
 - **Recycling:** Convert fleshings and shavings into value-added products.
 - **Composting:** Organic waste for soil amendment.
 - **Disposal:** Environmentally compliant disposal methods for non-recyclable waste.



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Pollution Prevention Opportunities

- **Cleaner Production Techniques**

- Adoption of **wet-white tanning** to reduce chromium pollution.
- Use of enzymes for dehairing instead of chemicals.
- Efficient wastewater treatment technologies like membrane bioreactors.
- Integration of renewable energy sources.

- **Waste Minimization Measures**

- **Process Optimization:** Enhance process control to minimize waste.
- **Raw Material Selection:** Use high-quality hides to reduce rework and waste.
- **Lean Manufacturing:** Eliminate unnecessary steps that generate waste.



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Pollution Prevention Opportunities

- **Resource Recovery:**
 - **Water Recovery:** Treat and reuse wastewater.
 - **Chemical Recovery:** Recover chromium and other chemicals for reuse.
 - **Energy Recovery:** Utilize biogas from anaerobic digestion of organic waste.
 - **Material Recovery:** Convert waste into useful by-products (e.g., gelatin from trimmings).



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Overview of Dairy Industry Waste

- **Types of Waste Generated**

- **Wastewater:** Rich in fats, proteins, lactose, and cleaning agents.
- **Solid Waste:** Includes sludge, packaging, and whey by-products.
- **Air Emissions:** Odor and volatile organic compounds.

- **Environmental Impact**

- High BOD and COD affect water bodies.
- Nutrient runoff leads to eutrophication.
- Improper disposal contaminates soil and water.
- Greenhouse gas emissions from energy use.



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Waste Audit Procedures

- **Wastewater Management**

- Pre-treatment: Screening and removal of solids.
- Primary treatment: Fats, oils, and grease (FOG) separation.
- Biological treatment for organic content.
- Advanced methods: Membrane filtration, wetlands.

- **Solid Waste Analysis**

- Categorize into recyclable, biodegradable, and hazardous.
- Explore composting and animal feed options.
- Minimize and recycle packaging waste.



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Pollution Prevention Opportunities

- **Wastewater Treatment Innovations**

- Anaerobic digestion for biogas production.
- Advanced oxidation for persistent pollutants.
- Use of natural filtration systems like wetlands.

- **By-product Utilization**

- Convert whey into protein concentrates.
- Use sludge in biogas plants or as fertilizer.
- Recover milk solids for additional processing.



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Pollution Prevention Opportunities

- **Energy Recovery**
 - Biogas generation from organic waste.
 - Heat recovery systems for energy savings.
 - Implement combined heat and power (CHP) systems.



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Overview of cement industry

- **Waste audits** in the cement industry focus on evaluating the types, amounts, and Environmental impact of waste generated during production.
- The goal is to identify areas for **waste reduction, reuse, and recycling** to improve sustainability.

- Types of waste:**

- Solid waste:** cement kiln dust (CKD), broken machinery, and scrap materials.

- Liquid waste:** wastewater from cleaning and cooling systems.

- Gaseous emissions:** CO_2 , NO_x , and particulate matter.



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Waste audit procedures

- **Identify waste streams:** catalog all types of waste generated.
- **Measure waste quantities:** quantify waste volumes through sampling and monitoring.
- **Analyze waste:** determine sources, disposal methods, and opportunities for waste reduction.
- **Report findings:** propose solutions for improving waste management and sustainability.

Emission monitoring:

- **Continuous monitoring:** use technologies like continuous emission monitoring systems (CEMS).
- **Track pollutants:** monitor gases like CO_2 , NO_x , SO_x , and particulate matter.
- **Compliance:** ensure emissions meet regulatory standards to reduce environmental impact.
- **Regular testing:** conduct periodic inspections and tests for accurate data.



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Pollution prevention opportunities:

- **Waste minimization:** reduce waste at the source to prevent pollution.
- **Cleaner production:** use energy-efficient technologies and cleaner processes.
- **Eco-friendly materials:** replace harmful materials with safer, more sustainable options.
- **Process optimization:** continuously improve production processes to reduce emissions and waste.



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Overview of Chemical Industry Waste:



- The chemical industry generates a wide range of waste products, including hazardous and non-hazardous waste.
- Waste audits are crucial to monitor the quantity, type, and impact of chemical waste generated.
- Goals include reducing waste, preventing pollution, and improving sustainability.

Types of waste generated:

- **Hazardous waste:** includes toxic by-products, solvents, acids, and heavy metals.
- **Non-hazardous waste:** organic residues, spent catalysts, and packaging waste.
- **Gaseous emissions:** vocs (volatile organic compounds), methane, and carbon monoxide.



Waste audit procedures:

- **Identify waste streams:** catalog the types and sources of waste generated in the chemical processes.
- **Measure quantities:** quantify the amount of waste produced at various stages of production.
- **Analyze disposal methods:** evaluate current disposal methods and identify opportunities for improvement.
- **Audit report:** propose solutions for waste reduction, reuse, and recycling.



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Pollution prevention opportunities:

- **Reduce waste at source:** implement changes in production processes to reduce waste generation.
- **Cleaner production techniques:** adopt technologies that minimize waste and reduce harmful emissions.
- **Eco-friendly materials:** use safer and more sustainable materials to replace toxic chemicals.
- **Closed-loop systems:** recycle materials within the system to reduce environmental impact.



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Definition and Importance of Transboundary Movement of Hazardous Wastes

- **Definition:** Transportation of hazardous waste across international borders for disposal, recycling, or treatment.
- **Importance:**
 - **Environmental Protection:** Prevents pollution and protects ecosystems.
 - **Public Health:** Reduces health risks from toxic exposure.
 - **Global Responsibility:** Shared duty for sustainable waste management.
 - **Economic Considerations:** Avoids costly clean-up and legal liabilities.



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Regulations Governing Transboundary Movement

- **Basel Convention:** Key treaty to reduce hazardous waste movement, requiring prior informed consent.
- **EU Waste Shipment Regulation:** Governs waste movement within/outside the EU, ensuring environmentally sound management.
- **National Regulations:** Countries have specific laws complementing international treaties.



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Procedures for Compliance

- **Notification and Consent:** Exporters must notify authorities and obtain consent from importing countries.
- **Documentation:** Essential records include waste manifests and contracts.
- **Tracking and Reporting:** Movement must be tracked and reported to ensure compliance.
- **Compliance with Destination Regulations:** Ensure waste meets importing country standards.



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Case Studies and Examples

- **Basel Convention Case:** Illegal export of hazardous waste from the U.S. to Africa highlighted enforcement needs.
- **EU Waste Shipment Regulation Example:** Legal actions against a member state for improper waste export.
- **E-Waste Trade:** Significant issue with improper management leading to environmental and health impacts.



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Overview of Disposal Methods

- **Landfill Disposal:** Containment in engineered landfills; requires monitoring and strict regulations.
- **Incineration:** High-temperature burning to reduce volume and toxicity; requires emission control.
- **Recycling and Recovery:** Processing to reclaim resources; must comply with safety regulations.



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Best Practices for Hazardous Waste Disposal

- **Characterization:** Identify waste composition and hazards.
- **Segregation:** Separate hazardous from non-hazardous waste.
- **Documentation:** Maintain thorough records for compliance.
- **Training:** Educate personnel on safe handling and disposal.
- **Emergency Preparedness:** Implement response plans for spills or accidents.



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Regulatory Compliance and Standards



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- **Overview:** Compliance is essential for safe hazardous waste disposal.
- **Key Regulations:**
 - **RCRA:** Governs hazardous waste management in the U.S.
 - **Basel Convention:** Regulates transboundary waste movement.
 - **EU Waste Framework Directive:** Sets waste management principles in the EU.
- **Compliance Requirements:** Labeling, storage, disposal, and reporting standards.





Conclusion

- **Summary of Key Points:** Effective disposal is crucial for health and environmental protection.
- **Importance of Waste Audits:** Identify improvements and promote sustainability.
- **Call to Action for Industries:** Develop comprehensive waste management plans and adopt pollution prevention measures.



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*Thank
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