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Internal Assessment Test 5 – January 2022

Sub:	Environmental Protection and Management					SubCode:	18CV753	Branch:	All Branches
Date:	09.02.2022	Duration:	90 mins	Max Marks:	50	Sem/Sec:	VII		OBE

Answer any five questions.
Provide neat sketches wherever necessary

		MARKS	CO	RBT
1	Write a short note on waste minimization planning in an industry. 1. Identify the Waste Your Facility Creates The first step is to identify your waste. Run a waste audit to figure out what waste your facility generates, what volumes of those wastes it produces and what departments produce the most waste. Identifying waste with the help of a waste audit is essential because it allows your organization to manage its waste more strategically. If you know much of your waste is regulated medical waste, you can contract with professionals who can dispose of it responsibly. If you know the bulk of your waste is wastewater that requires treatment before disposal, you can seek out a disposal company that treats wastewater at a dedicated facility. An audit like this is also beneficial for determining where excessive waste occurs in your business. If you know most of your waste disposal practices are relatively sustainable but one department produces disproportionate amounts, you can tailor your strategies toward helping that department reduce and recycle more. 2. Identify Waste Streams Industries would want to know how much hazardous waste and non-hazardous waste they are producing, as well as how much liquid and solid waste. This information is required to develop targeted disposal practices for each type of waste and ensure regulatory compliance. To dispose of certain waste streams, you may need specialized professional services. They can mitigate the risks associated with these wastes and ensure safe, responsible practices around them. 3. Establish a Waste Management Team Select responsible employees, to take charge of your waste management program. One of the main benefits of creating a waste management team is the accountability it generates. If no one is explicitly responsible for dealing with waste, this essential process may fall through the cracks. A dedicated team will put strict deadlines and protocols in place to ensure comprehensive, dependable management. 4. Assess Current Waste Disposal Methods Taking a tour of the facility and observingthe performance in areas like these: Placement of refuse and recycling bins Labeling of refuse and recycling bins Reliability of the services that pick up your facility's waste 5. Consider Your Waste Hierarchy Consider implementing a hierarchy that prioritizes sustainable processes like reusing and recycling over landfill disposal: Reduce: Start by examining where your facility can reduce its waste generation. Brainstorming ways to scale the sourcing back and minimize the amount of waste you produce. Reuse: Considering what types of waste the facility can repurpose. Recycle: Considering what waste can be diverted from the disposal stream and can be broken down for recycling. Recover: Waste products can be recovered for resale. Dispose: Generally, everything that remains after you've exhausted the options	[10]	CO3	L2

	above must go to a landfill. With effective waste management practices, you can often minimize the amount of waste that falls into this category and develop strategies for responsible disposal. 6. Select Waste Management Partners One of the most critical points of waste management plan involves choosing the right waste management partners for the business. One needs an externalfacility that has experience handling the types of waste the particular facility produces and can help the facility work towardstheir sustainability goals. 7. Set Targets for Waste Reduction Before implementing the new waste management plans, measuring and quantifyingthe existing waste management practices is important. After this targets must be set for the facility to achieve. 8. Create a Waste Management Action Plan Action plan should contain specific, detailed procedures for separating the facility's various types of waste, getting waste to its proper containers and arranging disposal pickups. It should also include the protocols one will follow to ensure compliance and address the procurement of adequate personal protective equipment (PPE) to protect the employees from contaminated waste. 9. Train Employees on New Procedures Even the best-crafted waste management action plan won't provide results if the employees don't understand or feel engaged with the new procedures. Facilitiesmust make a company-wide announcement of the new policies and then set up training sessions for their workers to increase their familiarity, confidence and investment. 10. Track Your Progress and Monitor for Adjustments Over time, tracking the organization's progress towards its goals, and altering your processes as necessary to enable consistent achievements is very important.			
2	Explain Management Systems audit as per ISO 19011. Quality Glossary Definition: ISO 19011 ISO 19011 is defined as the standard that sets forth guidelines for auditing management systems. The standard contains guidance on managing an audit program, the principles of auditing, and the evaluation of individuals responsible for managing the audit programs. An audit program consists of the arrangements made to complete all of the individual audits needed to achieve a specific purpose. ISO 19011:2018 provides valuable information on how to improve an audit program systematically, just as other departments in an organization are expected to improve. One aspect of such improvement is continuously ensuring the audit program objectives are in line with the management system policies and objectives. Organizations, in pushing for auditing improvements, should consider the needs of customers and other interested parties. An area of increasing importance in auditing management systems and business in general is the concept of risk. As of the 2011 edition, risk has been integrated throughout the audit program management section of the ISO 19011:2018 standard. **ISO 19011 Standard Facts** When the United States adopts its version of a standard, it is referred to as an American National Standard (ANS) and is the equivalent of an international standard. The ANSI version may or may not make changes to the international (ISO) version of the standard. In the case of ISO 19011, it is considered an identical adoption.	[10]	CO3	L2

	Who should use ISO 19011:2018? If your organization conducts internal or external audits of management systems, or if you manage an audit program, then ISO 19011 and the ANSI version apply to you. Anyone involved in audits or audit programs can use ISO 19011. More specifically, ISO 19011 is for people in charge of managing an audit program and evaluating individuals involved in the audit programs and audits. Anyone who has been tasked with improving an audit program will likely find ISO 19011:2018 of value. **What does ISO 19011:2018 accomplish?** • ISO 19011 offers guidance on every step of auditing a management system or audit program, including: • Defining program objectives • Ensuring you understand the specific objectives you hope to achieve • Making audit arrangements • Assigning roles and responsibilities • Defining number, scope, location, and duration of audits • Determining criteria and specific checklists • Establishing review procedures • Completing the audits needed • Planning and reviewing internal documents • Collecting and verifying audit evidence • Generating findings and preparing reports • Communicating findings • Reviewing the results and process • Assessing results and trends • Conforming with audit program procedures • Evolving needs and expectations of interested parties • Analyzing audit program records • Examining effectiveness of the measures to address risks • Ensuring confidentiality and information security			
3	Explain the roles and qualifications of environmental auditor. Anyone can be an ISO internal as well as external auditor. Internal auditor: Is from inside the company, trained to do internal auditing. They conduct auditing of the company on behalf of the company. External auditors: Professional auditors work for the certification bodies. There are no mandatory qualifications to become an auditor but certification bodies are required to demonstrate that their auditors are competent. **Achieving auditor competence** Auditor competence can be acquired using a combination of the following: a) successfully completing training programmes that cover generic auditor knowledge and skills; b) experience in a relevant technical, managerial or professional position involving the exercise of judgement, decision making, problem solving and communication with managers, professionals, peers, customers and other relevant interested parties; c) education/training and experience in a specific management system discipline and sector that contribute to the development of overall competence; d) audit experience acquired under the supervision of an auditor competent in the same discipline.	[10]	CO3	L2

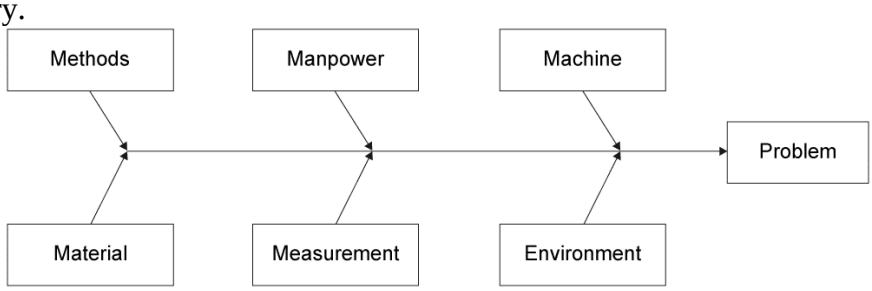
	ISO 19011 defines 7 key principles that help to ensure audits are effective and reliable tools, supporting the management systems they are auditing by providing actionable information that organizations can use to improve performance. These principles are designed to enable auditors working independently from one another to reach similar conclusions in similar circumstances. **(i) Integrity: The foundation of professionalism** Auditors and audit programme managers should perform their work ethically, in an honest and responsible manner, and using their best judgement should: Undertake audit activities only if competent to do so Perform work in a fair and unbiased manner Remain sensitive to influences exerted upon their judgement while carrying out audits **(ii) Fair presentation: the obligation to report truthfully and accurately** All audit findings, including documented evidence, conclusions and written reports should reflect truthfully and accurately the activities of the audit. This includes any obstacles, disagreements with other auditors, or difficulties faced during the audit. Everything must be adequately documented. It goes without saying that all communication, not just documented and reported information, should be truthful, timely, rational, clear, and complete. **(iii) Due professional care: Diligence and judgement in auditing** Auditors should exercise due professional care in all tasks performed during the audit, in accordance with the confidence placed in them by the auditee and in recognition of the importance of the task they are performing. One of the most important requirements of this principle is that auditors have the ability to make reasoned judgements in all situations during the audit. **(iv) Confidentiality: Security of information** Auditors should respect the confidentiality of all information they're dealing with throughout the audit. This means exercising due diligence in making sure all information acquired during the course of their duties as auditors is respected and adequately protected. Making sure information is secure includes taking special precautions where necessary, such as handling sensitive or confidential information. **(v) Independence: Audit impartiality and objectivity** Audits, by nature, should be independent of the activity being audited, to the furthest extent possible. They should not interfere with the activity, nor should they hold any bias or conflict of interest. If possible, internal audits should preferably be independent from the function being audited. Key to all audits is the pursuit of objectivity via rational process, to make sure all findings and results from the audit are based only on audit evidence. Smaller organizations may find it difficult to enlist truly independent auditors; as such every effort should be made to eliminate bias and encourage the pursuit of rational objectivity. **(vi) Evidence-based approach.** **(vii) Risk-based approach.**			
4	With suitable example, explain corrective and preventive actions after preparation of checklist. The systematic process for CAPA has not really changed in the newer ISO management system standards, which are aligned with the ISO Annex SL format. Corrective actions are about improving behavior or performance of the process, and this hasn't changed. In general, you need to:	[10]	CO3	L2

1) Identify the process problem – Define what the problem actually is. First, make sure the problem is, in fact, a real problem, and not a perceived problem. A good test is if you can write the problem with a requirement to compare, what is often called a "Should Be" and "Is" statement (e.g. Parts should be nickel plated, parts were received painted black). If you can't say what the outcome should be (or is expected to be), then you may not have identified a real problem.

2) Identify how big the problem is – What is the scope of the problem? Make sure you understand how big the problem to be addressed is. Is it just today's product, or was yesterday's product affected too? Is it just this one product, or is it on more than one product? Make sure you know what the problem is, and more importantly, what it is not. If the problem only happens on Wednesday, this may be important information.

3) Take action to contain the problem – How can we stop the problem while we fix the root cause? Make a correction to stop the problem for right now while you look for the ultimate cause and fix that. Basically, what immediate checks or stop gap measures are you putting in place to make sure that you will definitely catch the problem again if it recurs while you are fixing it.

4) Identify the root cause of the problem – What is the base of the problem, not just the surface manifestation? This is the trickiest part. How do you make sure you have found the underlying issue? There are many different ways to do this, from asking "Why" five times until you find the ultimate cause, to more difficult methods like a classic Ishikawa (or Fishbone) Diagram. Whole training courses have been dedicated to this topic, but suffice it to say that you want to try to identify the underlying problem, not just a surface problem. After this step, it is wise to make sure that your scope has not become bigger, making further containment actions necessary.



Fishbone Diagram
Potential causes of the problem separated into six categories

5) Come up with a plan to fix the root cause – What do you need to change to eliminate the root cause? Decide what steps are needed to eliminate the root cause of the problem. Here, depending on the problem, you will need to identify the cost and return on investment. How will it be funded (if it is a complicated and expensive fix), and who needs to approve the expense? Make sure the planned changes will not cause further problems.

6) Put your plan in place – Do what you have planned. This is as simple as following through on your plan and making it happen. It could be as simple as implementing the preventive maintenance program already described, or buying and installing a new piece of equipment because the old one could no longer keep the accuracy you need.

7) Check that your plan worked – Make sure your plan was effective. Simply put, after you have made your updates, wait a suitable amount of time and make sure the problem doesn't recur. If it does, you need to question if you got the actual root cause. This is the most important step, but also the step that most companies have trouble with. Often, people want to close out the paperwork quickly, or think the registrar requires closure early to demonstrate timeliness, but proper follow-up is essential.

	Many companies will have a corrective action form that follows this process, or a modified process, to capture the information and ensure that you do not forget any steps. Having a good systematic process is important to find and fix the root of the problem for large, systemic issues within your organization. If you only treat the symptom, then the problem will come back. The goal of corrective actions is to correct the root of the problem, so the failure does not recur.			
5	Write in brief about the procedure of conducting a waste audit in an electroplating industry. The waste audit identifies the various waste streams of the electroplating units. Waste minimization and treatment options are analyzed. This was done based on assessment of the waste characteristics and pattern of waste generation. The audit enables better understanding of the waste management plan that recommended substitution and better house keeping practices for management of wastes. The audit revealed that source reduction in the case of water usage, and better housekeeping practices could reduce wastage and contribute to economic benefits. A management plan was developed for the electroplating industries incorporating the concept of cleaner production for the attainment of water efficiency and management of wastes. **Step 1. Assemble a Team & Set a Date** • Find a volunteer from each department to form the company's waste auditing team. Aim for at least five people. May be one can hold audits every quarter, also it is recommended making this group an ongoing "Sustainability Committee" who can oversee any changes the company wants to make as a result of the audit. • Next, pick a week for the audit. The auditors might want a clear picture of the normal trash output, so choose a week without any special events and when most of the staff will be in the office. If the company has an outside custodial staff, make sure they know to hold off on emptying the trash that week. **Step 2. Determine the company's Waste Categories** • Before "Waste Audit Week" rolls around, make a list of the most common trash types the business produces. This list can be general in the initial stage—if the audit reveals different categories, the auditors can always add them to the list as the audit proceeds. **Waste Audit Categories:** Electroplating industry has been generating a huge amount of waste in the forms of wastewater, spent solvent, spent process solutions and sludge. The industry of Electroplating generates wastes in different forms which are solid, liquid and gaseous. **Solid** Solid waste includes residues such as cleaning powder; buffing compounds	[10]	CO3	L2

generated during the pre-treatment process and spent anodes during the plating process.

Liquid

The majority of the waste generated in electroplating process is in liquid form. They pollute the environment more as compared to solids and gases and consequences of uncontrolled affect the health seriously.

Characterization of Solid and Liquid wastes generated from Electroplating Industry

According to the Hazardous Waste Management and Handling Rules, 2002, the following wastes from Electroplating Industry are identified and listed in Schedule 1 as:

1. Acid Residues

2. Alkali Residues

3. Rinse water from pre-treatment and plating operations.

4. Spent bath containing sulphide, cyanide and toxic metals

5. Sludge from bath containing organic solvents

6. Phosphate Sludge.

7. Etching residues.

8. Plating metal sludge

9. Chemical Sludge from wastewater treatment

Characterization of Gaseous wastes generated from Electroplating Industry

Gaseous emissions come from the plating bath due to high temperature or excessive agitation. Gaseous emission may include the following wastes:

1. Vapours from Chlorinated solvents during pre-treatment

2. Volatile organic Compounds (VOCs)

3. Acid/ Alkali Mist

4. Vapours of Metals (such as Platinum, Hexavalent Chromium, Rhodium, Cadmium etc)

5. Vapours of chemicals (e.g. Nickel sulfamate fumes, Potassium cyanide fumes etc)

6. Cyanide vapours from plating bath.

7. Hydrogen fluoride and Ammonia vapours

Step 3. Gather Your Tools

• Before the main audit, the team would need to stock up on a few supplies to make sure the team can work safely.

Tools Needed for a Waste Audit:

• An open area for sorting the trash.
• Rubber gloves for each volunteer.
• Face masks for each volunteer.
• Tongs for each volunteer (optional).
• Labelled boxes for sorting each waste category.
• A bathroom scale for weighing each category.
• Clipboards for recording the findings.
• Trash bags for re-bagging the waste after the audit.

Step 4. Sort the Trash

• It's time for the real work to begin. Here's how to do a waste audit.
• At the end of the week, round up all the trash and recycling from the building.
• If the auditors would like to gather department-specific data, label each trash bag with the department it came from.
• Weigh all the trash to get a baseline for how much the company throws out each week.
• Weigh all the recyclables to establish how much the company can recycle each week.
• Wearing gloves, sort all materials into the boxes for their categories. If the trash is labelled by department, make sure each has separate boxes.
• As the auditors work, any recyclables mixed in with trash must be noted.
• Once everything has been sorted, weigh each category.

Step 5. Analyze the Results

• Now that all weights are recorded, this data can be used for a waste stream analysis.

a. Calculate and record the waste diversion rate using this process:

• Divide the weight of the recyclables by the combined weight of all your waste (trash + recyclables).
• Multiply the result by 100.
• This gives the percentage of waste you divert from the landfill each week.

b. Look at the weights recorded for individual waste categories.

• Which categories are highest?
• Did the highest categories differ between departments?
• Were any recyclables mixed in with the trash?

- Were there categories the auditors initially realize was present?
- Don't lose track of this waste audit report.
- As one takes steps to reduce waste, these numbers will become a powerful marketing tool, it can be used to show customers how hard you're working at greening your operation.

Step 6. Next Steps after Waste Auditing

- Determine whether the dumpster size and pickup frequency still matches the company's needs.
- If the trash output changed, a different size or number of pickups may be more cost-effective.
- Hire a recycling service if the company doesn't already have one.
- If the company is only recycling a few items, consider recycling more—either through your current service or one that specializes in waste from your industry.
- Set a goal for increasing the current recycling rate.
- Create recycling guidelines for meeting that goal and share them with the company staff.
- Set a goal for reducing the amount of waste in the largest categories.
- Determine the steps to meet that goal and let the staff know. For example, the auditors might switch to online bill pay to reduce paper. Or buy a different coffee maker to avoid wasteful coffee pods.
- Identify any items that can be reused. For example, can you repair or recycle your electronics instead of purchasing new ones? Can you repurpose any of your packaging materials?
- Decide on a timeline for meeting the recycling and reduction goals. One or two years usually makes sense. Plan to conduct another waste audit at that time to see if you met your goals.
- Changes can be made like:
- Switching from paper to cloth napkins in their dining area.
- Replacing paper towels with energy-efficient electric hand dryers in bathrooms.
- Using product labels with a recyclable backing where possible.

6 Explain the treatment of waste generated from tanning industry. [10] CO3 L2

In common Effluent Treatment Plants(ETP), to reduce pollution load in receiving waters, waste water treatment comprising an appropriate onsite and/or off-site combination of the following technique shall be applied for all the techniques design guidelines and appropriate statuary/norms/rules/guidelines have to be followed:
a) mechanical treatment;
b) physico-chemical treatment;
c) biological treatment;
d) biological nitrogen elimination; and
e) exceptional for strong water scarcity: membrane technologies and evaporation systems.

The applicability on site and/or off site, of an appropriate combination of the above techniques are described in the table below.

No.	Technique	Description	Applicability
1	Mechanical	Screening of gross solids,	Generally

			treatment	skimming of fats, oils, and greases and removal of solids by sedimentation.	applicable for on-site and/or off-site treatment				
		2	Physico-chemical treatment	Sulphide oxidation and/or precipitation, COD and suspended solids removal by, e.g., coagulation and flocculation. Chromium precipitation by increasing pH to 8.0 or above using an alkali (e.g. calcium hydroxide, magnesium oxide, sodium carbonate, sodium hydroxide, sodium aluminate). The main limitation of this technology is management of sludge which has to be dewatered and disposed of in secured landfill facilities only.	Generally applicable for on-site and/or off-site treatment				
		3	Biological treatment	Aerobic biological waste water treatment using aeration, including the removal of suspended solids by, e.g., sedimentation, secondary flotation.	Generally applicable for on-site and/or off-site treatment				
		4	Biological sulphide oxidation	Together with a pre-denitrification and nitrification, a simultaneous sulphide oxidation can be done biologically. Some special requirement for safety in case of nitrification-problems need to be installed	Applicable to plants with direct discharge to receiving water. Difficult for implementation into existing plants where there are space limitations.				
		5	Membrane technique and reverse-osmosis with evaporation systems (for exceptional circumstances only)	After biological treatment and elimination of dissolved solids by micro-, nano and ultrafiltration, reverse osmosis/ evaporation systems can be used in such exceptional circumstances for challenge of strong water scarcity and if the waste water need to be used for irrigation and no other recycled waste water (i.e. after municipal treatment) is available or not available in sufficient quantity	Applicable to plants in areas with extremely shortage of water (strong water scarcity) and no energy shortage. Difficult for implementation into existing plants where there are space limitations. A solution for the final residues (salt, non-biodegradable				

				substances) must be available.			

Air Emission Treatment -

a) Boiler dust emission especially for wood, renewables or coal fired boilers need dust treatment emissions like cyclones or similar.

b) Spray machine need to be equipped with water wash and activated carbon treatment or equal. Ensure that protection windows in the spray nozzle cabin are closed to protect the staff from VOC emission.

c) List all liquid finishing chemicals with the percentage of the organic solvent content (VOC) of each chemical and counted per unit of leather produced.

d) Hand spray booth is equipped with water-wash or activated carbon system or equal.

e) Weighing of powder dyestuff on a scale-weight with an exhaust system.

f) Buffing/De-dusting machines with dust exhausting systems, dust bag filters and dust cake pressing.

g) To reduce air-borne emissions of VOCs from finishing, use one or a combination of the techniques given below:

- The use of water-borne coating in combination with an efficient application system.
- The use of extractive ventilation and abatement systems.
- PU coating systems need special air treatment like internal incineration system or activated carbon filter. The activated carbon filters must be maintained and changed in time.

h) H_2S emission in beam house (liming/de-liming) and chemical storage/handling of NaHS and Na_2S need special H_2S monitoring systems (online or moveable metering systems with alarm function).

- Applicability: applies to all plants carrying out raw to finished leather processing.

7	Explain the application of EMS and pollution prevention in paper & pulp. Several control and treatment technologies have been developed to reduce wastewater discharge from the pulp and paper industry. The two major technology approaches are: 1. At source treatment controls measurements aimed at reducing wastewater volume and pollutant load discharged from the mill. 2. Wastewater treatment technologies or end-of pipe treatment system aimed at reducing discharge of pollutants in the wastewater Various approaches for the management of effluent discharged include **Segregation:** Highly concentrated and offensive effluents are segregated from relatively voluminous effluents. **Chemical Recovery**: Efficient recovery of chemicals from the spent liquor is an integral part of modern sulphate (kraft) and soda processes.	[10]	CO3	L2

Good Housing Keeping: Proper installation and operation of equipment, keeping them well cleaned before emptying into drain. Avoiding unnecessary biodegradable material to be dumped into waste stream, reuse of water when possible, reduces considerably the pollution load.

Reclamation and Recycling: About 80-90% reduction in pollution load and 70 % reduction in effluent volume in chipper house can be achieved through effluent reuse. Similarly recirculation in multi-stage bleaching operation reduces pollution loads by 30 - 80%. Effective fiber recovery from paper machine can reduce the pollution load by 20- 60% and volume by 60-80%.

Primary Treatment : It includes coagulation & flocculation, floatation and sedimentation. A well designed clarifier is considered most suitable and is expected to settle 90-95 % of the settleable solids and removes 25-30% of BOD. Clarifier should be designed for an overflow rate of 30 cubic meters per square meter per day and a detention time of three hours. Settled sludge is regularly pumped out at about 3% solid consistency. The sludge can be dewatered to speedable consistency by drying on usual drying beds, vacuum bed filters, and solid bowl centrifuges.

Biological Treatment : Depending upon the conditions at site and degree of treatment required for final disposal of effluents, biological treatment methods that can be adopted include; oxidation pond, aeration lagoon, trickling filter with secondary clarifier and activated sludge process.

REUSE OF WASTEWATER

Land application of the pulp and paper mill wastewater for growing a variety of crops has been reported from several parts of the world. Studies carried out by NEERI in one of the large pulp and paper mills in the country have revealed that:

- Wastewater can be successfully used by crop irrigation on coarse textured soils to raise salt tolerant crops, such as wheat, barley and maize, sugarcane and pulp grade wood plants.
- Soil retains color and removes COD in the wastewater.
- Sodium build up was noticed in the continuously irrigated soil with the wastewater, which could be overcome by using gypsum for reclamation.