Hazard Identification and Risk Assessment in Sewage Treatment Plant

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Abstract: Sewage Treatment Plant (STP) is an important infrastructure to ensure human health and the environment. HIRA is one part of the occupational safety and health program at the risk management stage. Control Measures taken to avoid potential risks include Personal Productive Equipment, Management Improvement Program, Emergency Manual, Performance Monitoring, Operational Control Procedure, Material Safety and Data Sheet, Health Plan and Legal Register. Very useful in overcoming potential hazards that have been determined.

Keywords: Hazard, chemical, legal register, MSDS

I. INTRODUCTION

Occupational safety and health is heavily influenced by occupational hazards identified and managed in a competent risk assessment process. Hazards in the workplace can be physical, chemical or psychological and can lead to workplace incidents and work-related injuries, which have an impact on organizational productivity and profitability. Hazard Identification Risk Assessment (HIRA) is a method for determining and providing hazards based on their probability, frequency and severity and evaluating adverse consequences, including potential loss and injury. The work process in the industry must pay attention to aspects of environmental health and safety in order to support the effectiveness of the industry. The industry must identify hazards, assess the associated risks to tolerate continuous levels, risk assessments have been made using risk guidelines and standards. Identifying potential risks and hazards at a sewage treatment plant can control the safety of industrial space and the surrounding environmental space and the personal working there in accordance with Environmental Health and Safety & Occupational Health and Safety Administration policies. This Sewage treatment process hazard risk assessment checklist uses a comparative analysis of the "Severity of Consequences" and "Probability of Occurrence" for each checklist item to assign a risk rating. The risk rating is then used to identify higher risk materials and overall operations. This risk assessment checklist is designed to assess the Sewage treatment process Safety operations and materials used in association with the Safety Checklist sections identified above.

II. METHODOLOGY

Hazard Identification Risk Assessment (HIRA) is a process of defining and describing hazards by characterizing their probability, frequency, and severity and evaluating adverse consequences, including potential losses and injuries.

a) Hazard identification: Hazard identification is part of the process used to evaluate if any particular situation, item, thing, etc. may have the potential to cause harm. The term often used to describe the full process is risk assessment: Identify hazards and risk factors that have the potential to cause harm (hazard identification). Normally following health, safety & environmental hazards that may be present during the terminal activities.5 step approach to hazard identification and risk assessment

Step 1: Look for Hazards. ...
Step 2: Decide who might be harmed, and how. ...
Step 3: Evaluate the risks and decide if current precautions are adequate or need improvement
Step 4: Record your findings. ...
Step 5: Review your assessment and revise it if necessary.

b) Hazard checking: A Hazard checklist contains questions or topics intended to prompt consideration of a range of safety issues. It can also be used in combination with structured hazard identification (HAZID) techniques such as SWIFT and HAZOP.

. If Hazard Analysis or Safety Assessment has already been carried out on a similar system, any available and relevant information should be incorporated into the Checklist.

C) Procedure for Risk Assessment: i) Look for the hazards through job safety analysis for all critical operations. ii) Decide who might be harmed and how. iii) Evaluate the risks and decide where the existing precautions are adequate or whether more should be done. iv) Record your findings. v) Review your assessment and revise it if necessary all the risks to be brought to ALARP after providing significant control measures.

Type / Conditions of the job :

During the risk assessment following type of jobs/situations/conditions was considered.

Routine: Done by Usual / Regular method of procedure.

Non Routine: Unusual / Non-Regular of procedure.

Normal Condition: Risks converted to tolerable conditions by way of engineering control or by using PPE.

Abnormal Condition : Deviation from normal condition, which requires immediate attention .

Emergency Condition: Hazards and Risks, which are contained or mitigated by invoking emergency procedures.

Table1.Description of Likelihood Level

Likelihood Rating	Assessment	Evaluation Criteria
1	Almost Certain	High likely, this event is expected to occur
2	Likely	Strong possibility that an event will occur and there is sufficient historical incidence to support it
3	Possible	Event may occur at some point, typically there is a history to support it
4	Unlikely	Not expected but there's a slight possibility that it may occur
5	Rare	Highly unlikely, but may occur in unique circumstances

Table 2. Risk Assessment Matrix

	1 Insignificant	2 Minor	3 Moderate	4 Major	5 Death
1 Rare	1	2	3	4	5
2 Unlikely	2	4	6	8	10
3 Possible	3	6	9	12	15
4 Likely	4	8	12	16	20
5 Certain	5	10	15	20	25

Likelihood' factors to consider: The existence of controls, written policies and procedures designed to mitigate risk capable of leadership to recognize and prevent a compliance breakdown; Compliance failures or near misses; Training and awareness programs.

Risk = Likelihood x Severity

The higher the risk of harm, the grater the chance of harm then the risk of harm. Before you control risk, you need to know what level of risk you are facing.

Severity	Description
1. Extreme	The presence of the hazard will automatically. result in unsafe food, Death or major injury can occur along with widespread I hospitalization, there are multiple consumer or customer complaints made. There will be extensive media reporting with product recall required. Our business will suffer extensive financial loss leading to bankruptcy or cease of trade, An Insurance claim is required.
2. Very High	The presence of the hazard will cause hospitalization of those affected. Prolonged medical treatment will be required. There may be mudhole consumer or customer complaints made. There will be extensive Reatha repointing with product recall required. Our trading partners I wholesale customers will lose toxiferines in our ability to supply safe food leading to loss of bu5iness. An insurance claim may be required.
	The preserve of the hazard may result in a customer complaint. Consumers do not suffer any long-term effect and do not require hospitalization although acute medical

3. Medium	treatment may occur. There is minimal long-term impact on the consumer. Affected stock may be returned to our business or financial compensator required. Consumer may use social media to communicate concerns.
4. Low	The presence of the hazard results in OD Couturier Injury sustained, there is minimal customer inconvenience and minimal firangi loss. Complairill3 main relate to serve or quality issues. There is minimal media impact.
5. Insignificant	The presence of the hazard does not and MI riot result in unsafe food. There Is no quire, illness or hospitalization if the hazard is consumed. There is no adverse finial effect on our business or that of our trading partners. There is no media impact.

CONTROL OF METHODS IN HIRA

Control Measures taken to avoid potential risks include Elimination, Engineering Control, Personal Productive Equipment, Management Improvement Program, Emergency Manual, Operational Control Procedure, Material Safety and Data Sheet, Health Plan and Legal Register.

1. ELIMINATION

Hazard elimination is a **hazard** control strategy based on completely removing a material or **process** causing a **hazard**. **Elimination** is the most effective of the five members of the hierarchy of **hazard controls** in protecting workers, and where possible should be implemented before all other control **methods**. Elimination also applies to processes.

2. ENGINEERING CONTROL

Engineering controls are more effective than administrative and PPE controls because they modify the work environment and equipment to reduce or isolate the worker from the source of the exposure to a hazard.

3. PERSONAL PRODUCTIVE EQUIPEMENT

Workers handling human waste or sewage should be provided proper PPE, training on how to use it, and hand washing facilities. Workers should wash hands with soap and water immediately after removing PPE. The following PPE is recommended for workers handling human waste or sewage

4. EMERGENCY PREPARRDNESS PROCEDURE

Major hazards can be generally associated with the potential of fire, flood, or earthquake or human activities of terrorism and disruption. Hazard control system is meant to ensure the avoidance of the hazards, or in case of any Mis-happening with minimum possible impact on facility occupants, surrounding residents and surrounding environment.

Most of the situations are likely to be in the category of Level 1 Emergency (a local incident with a likely impact only to immediate surroundings of local site, where the impact radius may not be more than 15 m, such as, local fire, etc.) or Level 3 Emergency (an incident with likely impact area extending beyond the boundary limits of the project area, such as, floods, earthquakes, etc.). On site emergency management will meet the exigency created due to all Level 1 emergencies. Level 3 emergencies need off-site management plan.

On-site emergency plan

Includes the following issues;

a) Formulation of the plan and of emergency services
b) Alarm and communication mechanisms
c) Appointment of personnel and definition of duties
d) Emergency control centers.
e) Chemical/material information
f) Action on site.

An off-site emergency plans

Will include the detailed information on following aspects;

a) Organizations – Details of command structure, warning systems, implementation procedures, emergency control centers, details of the key officers.

b) Communications – identification of personnel involved, communication center, call signs, networks, list of telephone numbers, etc.

c) Specialized emergency equipment

5. OPERATIONAL CONTROL PROCEDURE

An Operational Control Procedure (OCP) is a written document that provides step-by-step instructions on how to safely perform a task or activity which involves some risk to health and safety. An **operational Control procedure** a safe work procedure is sometimes referred to as or **safe** work method statement.

6. MATERIAL SAFETY DATA SHEET

safety data sheet (**MSDS**), **material safety data sheet** (**MSDS**), or **product safety data sheet** (**PSDS**) is a document that lists information relating to OCCUPATIONAL SAFETY AND HEALTH for the use of various substances and products. SDSs are a widely used system for cataloguing information on chemicals, chemical compounds, and chemical mixtures. SDS information may include instructions for the safe use and potential hazards, associated with a particular material or product, along with spill-handling procedures

	Hazard Identifiction and Risk Assessment (HIRA)	**HIRA NO : HIRA001** **Date : 19.03.2021** **Page : 01**

SI NO	Area		Hazard	Risk	Condition			LR	Evaluation			Control method (1,2,3,4,5,&6)
	R	NR			N	A	E		L	SEV	Risk Rating	
	LOCATION ; BUFFER TANK AND UASBR TANK											
1	*		Cow Dong works from a dangerous area.	When mixing the Cow Dong in the Buffer Tank there is is a risk of falling down as it works from the tip area.	*				1	1	1	1
2		*	From an height area without PPE ,do the Cleaning work.	Working at heights without any restraint carries the risk of falling down.		*			2	2	4	7
3		*	Improper handling of Food Waste.	If water is not mixed wih food waste in the right proportions,repairs will occur in the food waste grinder.	*				1	1	1	3
4	*		Due to the vibrations of the UASBR Tank pipe, the settled area is broken.	Environmental pollution and sanitation deterioration.	*				3	4	12	2
5	*		The Bio gas emitted from the UASBR Tank is discharged through the Flare Stack and the place where fire is placed is in an unsafe condition.	The igniting iron rod slips and falls on the worker, causing burns.			*		4	3	12	3
6	*		On a Ladder without a handle climp up and note the readings of the flow meter from the Buffer Tank to UASBR Tank.	Slipping injury can occury.		*			3	2	6	6
7	*		Water leaks from the Buffer Tank in to the UASBR Tank pump.	If water enters the motor, it will malfuntion and stop pumping water through the	*				1	1	1	3

				pump.								
8		*	Buffer Tank to UASBR Tank , Motor is not fencing.	Easily corroded and coil is easily damaged.		*			2	2	4	3
9		*	Aerator -1 is Oil leakage.	Slipping injury can occury.	*				1	1	1	3
10	*		Aerator -2 Earth is not connected in this line.	Any electrical problem can be easily shocked		*			3	3	9	4
11	*		Without barrication in Clarifier Tank.	When making a flow meter reading note, there is a risk of falling down.			*		4	3	12	8
12	*		Inhalation of chlorine gas at chlorination process.	Vomiting,Headache, Chest pain.		*			4	4	16	5
13	*		The handle of the staircase in the Filter Feed Tank is not barricaded	There is a risk of falling down while making a flowmeter reading note.	*				1	1	1	3
14		*	The motors in the Sludge Sump are processed without fenced.	Operators who work in oversized clothing are easily to have an accident.		*			2	2	4	3
15		*	WARNING Symbol, Emergency Precautions & CAUATION Label is not displayed at UV Lamp.	Working without proper knowledge about the UV Lamp can easily cause an accident and cannot control it.	*				1	1	1	3
16	*		The Radiator in the GENSET-II are in processed without fenced.	Operators who work in oversized clothing are easily to have an accident.		*			3	3	9	4
17	*		The Overflow water from the Radiator is discharged directly to the ground through a water level hose.	Slipping injury can occury.			*		4	3	12	8
18	*		Noise Level is not tested in GENSET ROOM.	If the Noise is not measured,unfortunately if it is too high,High Blood Pressure,Stress and Headaches will occur.		*			4	4	16	6

Legend : N- Normal, A-Abnormal, E-Emergency, LR- Legal requirement R-Routine activity NR- Non-routine activity
Rating : L - Likelihood, SEV- Severity
Control method : 1) Elimination , 2) Engg. controls , 3) OCP -Operational control procedure, 4) Emergency, Preparedness Manual & Mock drills, 5) MSDS- Material Safety Date Sheet, 6) LR- Legal Register , 7) Wear PPEs- Personnel Protective Equipment , 8) Management Improvement Programme

Type / Conditions of the job:

During the risk assessment following type of jobs/situations/conditions was considered.

III. CONCLUSION

Hazard Identification and Risk Assessment (HIRA) of the various hazards occurring in this situation were examined and the process was detected and evaluated. Proper training is provided to avoid the occurrence of such hazards. Applicable legal requirements were reviewed and outlined in detail. In this paper I explored risk identification and risk assessment technique to assess all risks and established priorities so that the most dangerous situations can be addressed first and major issues can be considered.

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