

Standard Operating Procedure and Checklist of Minimal Requisite Facilities for utilization of hazardous waste under Rule-9 of the Hazardous and Other Wastes (Management and Transboundary Movement) Rules – 2016

Utilization of Spent Hydrochloric Acid (*generated during manufacturing of manufacturing of Mono Chloro Acetic Acid/ Chloro Benzene/ Chloro Paraffin Wax/ Trifluoroacetic acid*) in the manufacturing of Ossein and subsequently Gelatine from such Ossein



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**Central Pollution Control Board
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Procedure for grant of authorization by State Pollution Control Board (SPCBs)/Pollution Control Committee (PCCs) for utilization of Hazardous waste

- 1) While granting authorization for utilization of hazardous wastes, SPCBs/PCCs shall ensure that authorization is given only to those wastes for which Standard Operating Procedures (SOPs) for utilisation have been circulated by Central Pollution Control Board (CPCB) ensuring the following:
 - a) The waste (intended for utilization) belongs to similar source of generation as specified in SOP.
 - b) The utilization shall be similar to as described in SOP.
 - c) End-use/ product produced from the waste shall be same as specified in SOP.
 - d) Authorization shall be granted only after verification of details and minimum requisite facilities as given in SOP.
 - e) Issuance of passbooks (similar to passbooks issued for recycling of used oil, waste oil, non-ferrous scraps, etc.) for maintaining records of receipt of hazardous waste for utilization.
 - f) Monitor closely the quantity of hazardous waste (Spent Hydrochloric Acid) being sent by Mono Chloro Acetic Acid, Chloro Benzene, Chloro Paraffin Wax and Trifluoroacetic acid plants (Generators) and the quantity being utilized by authorized facilities in production of Ossein and subsequently Gelatine from such Ossein. The end products being made using Ossein may also be monitored.
- 2) After issuance of authorization, SPCBs/PCCs shall verify the compliance of checklist and SOP on quarterly basis for initial 1 year; followed by random checks during subsequent period for at least once a year. The compliance reports may be submitted to CPCB.
- 3) In-case of lack of requisite infrastructures with the SPCBs/PCCs, they may engage 3rd party institutions or laboratories having EPA, 1986/NABUIS017025 accreditation / recognition for monitoring and analysis of prescribed parameters in SOPs for verification purpose.
- 4) SPCBs/PCCs shall provide half yearly updated list of units permitted under Rule 9 of Hazardous & Other Wastes (Management & Transboundary Movement) Rules, 2016 (HOWM Rules, 2016) to CPCB and also upload the same on SPCB/PCC website, periodically.
- 5) Authorization for utilisation shall not be given to the units located in the State/Union Territory where there is no Common TSDF, unless the unit ensures authorised captive disposal of the hazardous waste (generated during utilisation) or its complete utilisation or arrangement of sharing with any other authorised disposal facility.
- 6) In case of the utilization proposal is not similar with respect to source of generation or utilization process or end-use as outlined in this SOP, the same may be referred to CPCB for clarification /conducting trial utilization studies and developing SOPs thereof.
- 7) The source and work zone standards suggested in the SOP are based on EPA notified and OSHA standard respectively, however, SPCBs/PCCs may impose more stringent standards based on the location or process specific conditions.
- 8) SPCBs/PCCs shall ensure that the utilizer of Spent Hydrochloric Acid shall maintain daily records in National Hazardous Waste Tracking System (NHWTS).



116.0 Utilization of hazardous waste (H.W.):

Type of HW	Source of generation	Recovery/ Product
Spent Hydrochloric Acid [Class B-15 (Inorganic Acids) and C2 of Schedule II of HOWM Rules, 2016]	Generated during manufacturing of Mono Chloro Acetic Acid, Chloro Benzene, Chloro Paraffin Wax and Trifluoroacetic acid	Manufacturing of Ossein and subsequently Gelatine from such Ossein.

116.1 Source of Waste:

Spent Hydrochloric Acid generated during manufacturing of manufacturing of Mono Chloro Acetic Acid, Chloro Benzene, Chloro Paraffin Wax and Trifluoroacetic acid. This is categorized as Hazardous Waste under Class B-15 (Inorganic Acids) and C2 of Schedule II of HOWM Rules, 2016, which is required to be disposed in an authorized disposal facility in accordance with authorization condition, when not utilized as resource recovery.

Table 1. Typical Characteristics of Spent Hydrochloric Acid (generated during manufacturing of Chloro Benzene)

Sr.No.	Test parameters	Unit	Spent HCl
1.	Moisture Content	%	68.20%
2.	Specific Gravity	--	1.15
3.	Purity as HCl	%	31.32
4.	TOC	mg/L	98.2
5.	Free chlorine	mg/L	16
6.	Benzene	mg/L	10.60
7.	1,3 - Dichlorobenzene	mg/L	0.62
8.	1,4 - Dichlorobenzene	mg/L	140
9.	Iron as Fe	mg/L	7.52

Note: SPCBs/PCCs to check the characteristics of Spent Hydrochloric Acid (during manufacturing of manufacturing of Mono Chloro Acetic Acid, Chloro Benzene, Chloro Paraffin Wax and Trifluoroacetic acid) prior to issuance of authorization, any significant deviation with respect to typical values mentioned in the table above may be examined with respect to the source or may be referred to CPCB.

116.2 Utilization Process of Spent Hydrochloric Acid:

a. Manufacturing Process of Ossein:

In Ossein production, crushed bones are charged into acidulation vessels, where they undergo demineralization using hydrochloric acid at a controlled temperature for 7-8 days. The demineralized bones (Ossein) are then washed with water and lime, dried using a pit dryer with hot air, and neutralized with controlled lime solution until pH 5.0. The resulting slurry is filtered using a rotary vacuum belt filter, and the wet cake is dried in a suspension dryer that generates Dicalcium Phosphate (DCP).

b. Manufacturing Process of Gelatine:

For Gelatine manufacturing, the demineralized bones (Ossein) undergo liming in pits with a milk of lime solution for 45-60 days under controlled temperature. The limed Ossein is then washed with water, acids, and alkalis to control pH before extracting gelatine with hot water. The extracted gelatine liquor is pre-filtered, and its pH is adjusted before undergoing deionization using ion exchange resins. The deionized gelatine is concentrated by evaporation, chilled, and processed into gelatine noodles using a special jelling apparatus. The gelled noodles are then dried under controlled conditions, pulverized, and blended as per customer requirements.

In both of the above manufacturing processes Spent Hydrochloric Acid shall be utilized following the three stage of manufacturing process as below:

- 1) **Demineralization Process:** In this process, acid is used for acidulation (demineralization) of bones.
- 2) **De-liming stage:** At this stage acid is used after De-liming to maintain the pH of ossein.
- 3) **Deionization stage:** In this stage acid is used to regenerate the cation resins in Ion exchange plant where Gelatine is deionized.

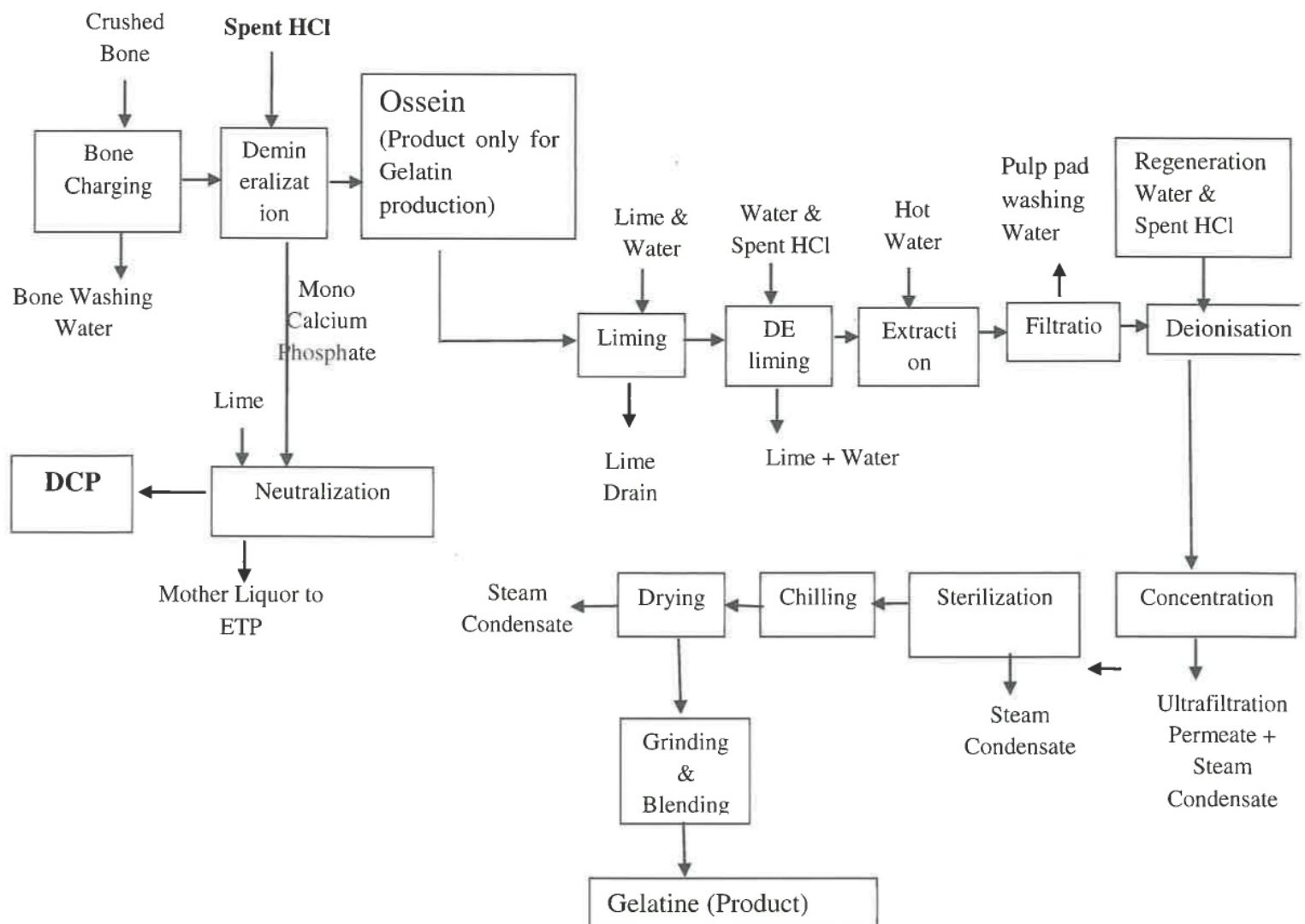


Figure: 1-Process flow diagram for utilization of Spent Hydrochloric Acid.

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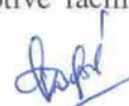
116.3 Standard Operating Procedure for utilization of Spent Hydrochloric Acid:

This SoP is applicable only for the Utilization of Spent Hydrochloric Acid (generated during manufacturing of manufacturing of Mono Chloro Acetic Acid/ Chloro Benzene/ Chloro Paraffin Wax/ Trifluoroacetic acid) in the manufacturing of Ossein and subsequently Gelatine from such Ossein.

- 1) The Spent HCl shall be procured only in SPCB/PCC authorized acid proof barrels/closed tanks with acid proof liners, mounted over vehicles fitted with requisite safeguards ensuring no spillage of the acid.
- 2) There shall be a designated space for unloading of spent HCl to the storage tank made of Stainless steel/tanker with acid proof liners. The receiving storage tank shall be placed above the ground and contained with low raise parapet/bund wall with slope to collect spillages, if any, into the collection pit.
- 3) The unit shall install storage tanks under cool, dry, well ventilated covered storage shed(s) within premises, as authorized by the concerned SPCB/PCC under HOWM Rules, 2016.

Further, the unit shall provide separate storage area at designated place which have leak-proof floor tiles with adequate slope to collect spillage, if any, into a collection pit. The spillage from collection pit shall be transferred to ETP, as the cases may be, through chemical process pump.

- 4) There shall be no manual handling of the Spent Hydrochloric acid. Spent Hydrochloric acid shall be unloaded from the closed tanker to the storage tank through pipelines using dedicated transfer pump. Spill containment arrangement shall be provided around the Spent Hydrochloric acid storage tanks.
- 5) The unit shall ensure that prior to utilization, TOC level of Spent HCl should be less than 100 mg/l.
- 6) The unloading, storage, transfer and other handling of Spent Hydrochloric acid from entire utilization process shall be carried out through dedicated mechanical transfer pump with fixed pipeline in closed system. Manual handling shall be strictly prevented.
- 7) The unit shall provide fumes extraction system in the process area.
- 8) Adequate alkali scrubbing system shall be provided to the HCl storage tanks and the reactors.
- 9) The treated gases shall comply with emission norms prior to dispersion into atmosphere through stack. The stack height shall be minimum of 30m from ground level or as prescribed by the concerned SPCB/PCC, whichever is higher.
- 10) Treatment and disposal of wastewater:
Wastewater generated from floor-washings, spillages, equipment washing, mother/ process liquor, scrubber bleed etc. shall be treated Physico- Chemically in an ETP or may be sent to CETP for final disposal or be treated further in a captive facility to comply with surface water discharge standards.



In case of zero discharge, the treated waste water from ETP may be managed as per conditions stipulated by the SPCB / PCC. Otherwise, the treated effluent shall be discharged in accordance with the conditions stipulated in the Consent to Operate issued by concerned SPCB / PCC under the Water (Prevention and Control of Pollution) Act, 1974.

- 11) The hazardous wastes (namely Di Calcium Phosphate, residue, ETP sludge etc.) generated shall be collected and temporarily stored in nonreactive drums/ bags under a dedicated hazardous waste storage area and be sent to authorized common TSDF or other authorized facility within 90 days or within period from generation of the waste in accordance with the authorization issued by the concerned SPCB/PCC. Such storage area shall be covered with proper ventilation.
- 12) Unit shall ensure the safety measures such as safety valves to appropriate equipment where, the high pressure process may involve.
- 13) The unit shall ensure that the Spent Hydrochloric Acid is procured only from authorized industries (involved in production of Mono Chloro Acetic Acid, Chloro Benzene, Chloro Paraffin Wax and Trifluoroacetic acid) by the concerned SPCB/PCC as required under HOWM Rules, 2016.
- 14) In case the unit involved in manufacturing of only 'Ossein' then the unit shall ensure that the recovered Ossein (produced by utilizing Spent Hydrochloric Acid) is sold to industries consented by the concerned SPCB/PCC for production of Gelatin.
- 15) Submission of details of end users to whom the Ossein (produced by utilizing Spent Hydrochloric Acid) is to be supplied and verification by the SPCB of the requirement of such end users, especially their capacity to use the Ossein.
- 16) Transportation of Spent Hydrochloric Acid shall be carried out by sender (generator) or receiver (utilizer) only after obtaining authorization from the concerned SPCB/PCC under HOWM Rules, 2016. Requisite manifest document shall be followed as laid down under the said Rules.
- 17) Prior to utilization of Spent Hydrochloric Acid, the unit shall obtain authorization for collection, handling, storage, utilization of Spent Hydrochloric Acid and disposal of hazardous wastes generated during the said utilization process; from the concerned SPCB/PCC under HOWM Rules, 2016.
- 18) The unit shall maintain proper ventilation in the work zone and process areas. All personnel involved in the plant operation shall wear proper personal protective equipment (PPE) specific to the process operations involved and type of chemicals handled as per Material Safety Data Sheet (MSDS). The safety precautions of the worker shall be in accordance with the Factory Act, 1948, as amended from time to time.
- 19) In case of environmental damages arising due to improper handling of hazardous wastes including accidental spillage during generation, storage, processing, transportation and disposal, the occupier (sender or receiver, as the case may be) shall be liable to

implement immediate response measures, environmental site assessment and remediation of contaminated soil/ groundwater/ sediment etc. as per the "Guidelines on Implementing Liabilities for Environmental Damages due to Handling & Disposal of Hazardous Wastes and Penalty " published by CPCB.

- 20) The unit shall provide suitable fire safety arrangements and flame proof electrical fittings.
- 21) During the process of utilization and handling of hazardous waste the unit shall comply with requirement in accordance with the Public Liability Insurance Act, 1991 as amended, wherever applicable.

116.4 Product Usage / Utilization

- 1) The products Ossein and Gelatin manufactured by utilizing Spent Hydrochloric acid (HCl) is used as below:
 - Ossein is used for manufacturing of Gelatine only.
 - Gelatine is used in Pharmaceutical Industry, Food Industry, Photographic Industry.
- 2) If Ossein and Gelatin, which is manufactured by using spent HCl then additional precautionary measures for the final products shall be considered. However, the same shall meet with standards prescribed by Indian pharmacopoeia (IP) for manufacturing of IP grade and be certified by Food and drug administration. The quality of products shall be governed by the regulatory framework.
- 3) The Product Gelatin intended for use in food processing industry shall comply Bureau of Indian Standards (BIS) - IS:5719:2005.
- 4) The unit shall label its products manufactured by utilizing Spent Hydrochloric acid as "This Ossein and/ or Gelatin has been manufactured by utilizing Spent Hydrochloric acid (generated during manufacturing of manufacturing of Mono Chloro Acetic Acid/ Chloro Benzene/ Chloro Paraffin Wax/ Trifluoroacetic acid)."
- 5) Food & Drugs Control Administration; and Food Safety and Standards Authority of India found the quality of Gelatin products manufactured by utilizing Spent HCl satisfactory.
- 6) The utilization is limited to use of Gelatin/Ossein in Gelatin products and does not apply to DCP produced in the utilization process.

116.5 Record>Returns Filing

- 1) The unit shall maintain a passbook issued by concern SPCB/PCC and maintain details of each procurement of Spent Hydrochloric Acid as mentioned below:
 - Address of the sender
 - Date of dispatch
 - Quantity procured
 - Seal and signature of the sender
 - Date of Receipt in the premises
- 2) A log book with information on source and date of procurement of Spent Hydrochloric Acid, date wise treatment & utilization of the same, hazardous waste generation and its disposal, etc. shall be maintained including analysis report of fugitive emission

monitoring & effluent discharged, as applicable.

- 3) The unit shall maintain record of hazardous waste generated, utilized and disposed as per Form-3 & also file an annual return in Form-4 as per Rule 20 (1) and (2) of HOWM Rules, 2016, to concerned SPCB/PCC.
- 4) The unit shall submit quarterly and annual information on hazardous wastes consumed, its source, products generated or resources conserved (specifying the details like, type and quantity of resources conserved) to the concerned SPCB/PCC.
- 5) Each procurement, production and transportation details (alongwith quantity of hazardous waste generated, utilized & disposed) shall be maintained on the National Hazardous Waste Tracking System/ Vehicle Location Tracking System (VLTS).

116.6 Standards

- 1) Source emissions from the stack connected to stack of APCD provided at source of emission such as reactor shall comply with the following Emission standards or as prescribed by the concerned SPCB/PCC, whichever is stringent;

Particulate Matter	150 mg/Nm ³
HCl	35 mg/Nm ³
TOC	20 mg/Nm ³

- 2) Fugitive emission in the work zone area shall comply with the following standards:

PM ₁₀	5 mg/m ³ TWA* (PEL)
HCl (Acid Mist)	7 mg/m ³ #
Chlorine	3 mg/m ³ #

*PEL - Permissible Exposure Limit.

*Time-weighted average (TWA)- measured over a period of 8 hours of operation of process.

- A ceiling limit is one that may not be exceeded for any period of time, and is applied to irritants and other materials that have immediate effects.

- 3) Monitoring of the above specified parameters for Source emissions and Work zone emission shall be carried out quarterly for first year followed by at least annually in the subsequent year of utilization. The monitoring shall be carried out by ISO 17025 accredited or EPA, 1986 approved laboratories and the results shall be submitted to the concerned SPCB/PCC on a quarterly basis.
- 4) Standard for wastewater discharge: Treated effluent shall be discharged in accordance with the conditions stipulated in Consent to Operate issued by concerned SPCB/PCC under the Water (Prevention and Control of Pollution) Act, 1974. In case of zero discharge or no discharge condition stipulated in the consent or non-availability of the common Effluent Treatment Plant (CETP), zero discharge shall be met.

116.7 Siting of Industry

Facilities for utilization of Spent Hydrochloric Acid shall be preferably located in a notified industrial area or industrial park/estate/cluster and in accordance with Consent to Establish issued by the concerned SPCB/PCC.

116.8 Size of Plant and Efficiency of Utilisation

116.8 Size of Plant and Efficiency of Utilisation

0.13 kg of Gelatine and 0.26 kg of Ossein is produced by utilizing 1 kg of Spent Hydrochloric Acid. Therefore, requisite facilities of adequate size of storage shed and other plant & machineries shall be installed accordingly.

116.9 Online detectors/ Alarms/ Analysers

In case of continuous process operations, online emission analyzers for PM and HCl mist the stack shall be installed and the online data be connected to the server of the concerned SPCB/PCC.

116.10 Checklist of Minimal Requisite Facilities:

S. No	Particulars
1.	Storage tanks of adequate capacity to store Spent Hydrochloric Acid. Such storage tank shall be placed above the ground and contained with low rise parapet/bund wall and acid proof floor with slope to collect spillages, if any, in to collection pit.
2.	Cool, dry well-ventilated covered sheds for Spent Hydrochloric Acid storage tanks, product storage tanks and process activities within premises and dedicated hazardous storage area for temporary storage of hazardous waste generated during utilization process.
3.	Mechanized systems for handling & transfer of Spent Hydrochloric Acid.
4.	The process shall have proper ventilation preferably with ventilation ducts above process units
5.	Spare vessel to transfer the reaction mass, if any, in case of leakage or damage to the reaction vessel.
6.	Pre- treatment facility for spent HCl to reduce the TOC < 100 mg/L; if TOC of Spent HCl > 100 mg/L
7.	Pumps, pipes, feeders and equipment for mechanical handling of Spent Hydrochloric Acid.
8.	Storage tanks
9.	Reactors
10.	Filtration units
11.	Adequate alkali scrubbing system to the HCl storage tanks and the reactors
12.	Effluent treatment plant of adequate capacity
13.	Adequate alkali scrubbing system shall be provided to the HCl storage tanks and the reactors
14.	Stack to have sampling port, platform, access to the platform etc as per the guidelines on methodologies for source emission monitoring published by CPCB under Laboratory Analysis Techniques LATS/80/2013-14.
15.	Online analysers for PM and HCl mist in the stack in case of continuous process operations.

