

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 ETP Sludge generated from wastewater treatment of ceramic industries in manufacturing of Ceramic products



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Central Pollution Control Board
(Ministry of Environment, Forest & Climate Change, Government of India)
Parivesh Bhawan, East Arjun Nagar,
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**Utilization of ETP Sludge generated from wastewater treatment of ceramic industries
in manufacturing of Ceramic products**

**Procedure for grant of authorization by State Pollution Control Boards (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 utilization have been circulated by Central Pollution Control Board (CPCB) ensuring the following:
 - a. The waste (intended for utilization) should have same source of generation as specified in SoP.
 - b. The utilization shall be same 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 the passbooks issued for recycling of used oils, waste oil, non-ferrous scraps, etc.) for maintaining records of receipt of hazardous wastes for utilization.
- 2) After issuance of authorization, SPCB shall verify the compliance of checklist and SOPs on quarterly basis for initial 02 years; followed by random checks in subsequent period for at least once in every year. The compliance report shall be submitted to CPCB by July every year.
- 3) In-case of lack of requisite infrastructures with the SPCBs/PCCs, they may engage 3rd party institutions or laboratories having EPA, 1986/NABL/ISO17025 accreditation/recognition for monitoring and analysis of prescribed parameters in SoP 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. Such updated list shall be sent to CPCB on a half yearly basis i.e. by July and January respectively.
- 5) Authorization for utilization shall not be given to the units located in the State/UT where there is no Common TSDF, unless the unit ensures authorized captive disposal of the hazardous waste (generated during utilization) or its complete utilization or arrangement of sharing with any other authorized disposal facility.
- 6) In case of the utilization proposal is not same 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 SoPs are based on the E(P)A notified and OSHA standards, respectively. However, SPCBs/PCCs may impose more stringent standards based on the location or process specific conditions.

**Utilization of ETP Sludge generated from wastewater treatment of ceramic industries
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81.0 Utilization of ETP Sludge:

Type of HW	Source of generation	Recovery/Product
ETP sludge (Category 35.3 of Schedule I of HOWM Rules, 2016)	Wastewater treatment of ceramic industries	As partial raw material in manufacturing of ceramic products (i) Ceramic glaze mixture and (ii) Industrial ceramics

81.1 Source of Waste

The ETP sludge is generated from settling tank of ETP for treatment of wastewater generated during manufacturing process of ceramics industry. The ETP sludge is categorized as hazardous waste as category 35.3 of Schedule I of HOWM Rules, 2016 which is required to be disposed in authorized disposal facility in accordance with authorization condition, when not utilized as energy or resource recovery.

Table 1:- Characteristic of ETP Sludge generated from ceramic industries:

S.no.	Parameters	Results	S.no.	Parameters	Results
1	SiO ₂	63.60 %	12	Ammonical Nitrogen	8.8 mg/kg
2	Al ₂ O ₃	20.7 %	13	Total Organic Carbon	0.36%
3	Na ₂ O	4.68 %	14	COD	1935 mg/l
4	CaO	3.96 %	15	Total Chromium	7.95 mg/kg
5	K ₂ O	2.66 %	16	Lead	12.92 mg/kg
6	ZrO ₂	1.16 %	17	Copper	10.93 mg/kg
7	MgO	1.46 %	18	Nickel	4.97 mg/kg
8	ZnO	0.48 %	19	Zinc	1516 mg/kg
9	Fe ₂ O ₃	0.50 %	20	Cadmium	<0.2 mg/kg
10	TiO ₂	0.25 %			
11	pH	8.40			

81.2 Utilization Process of hazardous waste (ETP Sludge)

In manufacturing of Ceramic Glaze Mixture:

Ceramic glaze mixture are tiny glass particles which are used as impervious layer or coating on ceramic tiles/wares. The basic raw materials for this product are Quartz, Feldspar Calcite, Dolomite, Borosil Glass, SRC Colomnaite and Borex. These raw materials, in powdered form and as per required composition, are mixed in a mixer along with ETP sludge and charged into a hopper attached to a furnace. The furnace is fired using natural gas and a temperature of 1300°C is maintained inside the furnace. The mixture is slowly fed into the furnace to maintain its temperature. After about 5 to 6 hours, the melted material in form of glass is poured continuously into a bucket in presence of cooling water for quenching. The wet finished product is drained of water after cooling and before packaging.

**Utilization of ETP Sludge generated from wastewater treatment of ceramic industries
in manufacturing of Ceramic products**

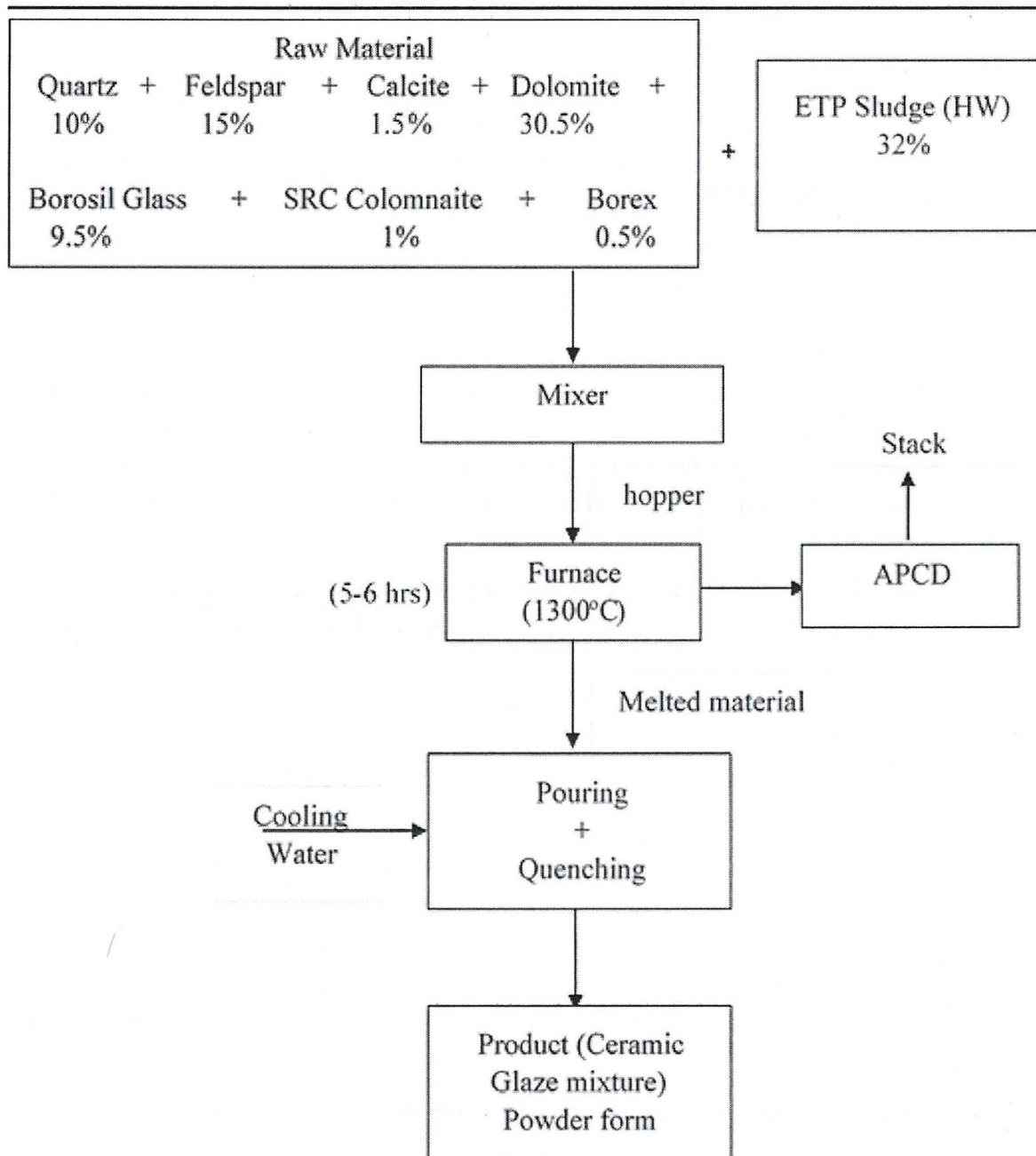


Figure 1: Process flow diagram for utilization of ETP sludge in manufacturing of Ceramic Glaze Mixture

In manufacturing of Industrial Ceramics

The product named 'Industrial ceramic' is a prism shaped about 2 inch block used as packing material in various industries. The basic raw materials for this product are China Clay, Quartz, Feldspar, Talc and Than-Clay. These raw materials are mixed as per required composition along with ETP sludge and grinded in ball mill for 11 to 12 hours with water. The grinded mixture is passed through filter press to separate cake and water. The separated cake from filter press is fed in pug mill to give required shape and cut into small pieces. These raw pieces of cake is dried and later fired at 1250°C in continuous tunnel furnace/kiln for about 24 hours.

**Utilization of ETP Sludge generated from wastewater treatment of ceramic industries
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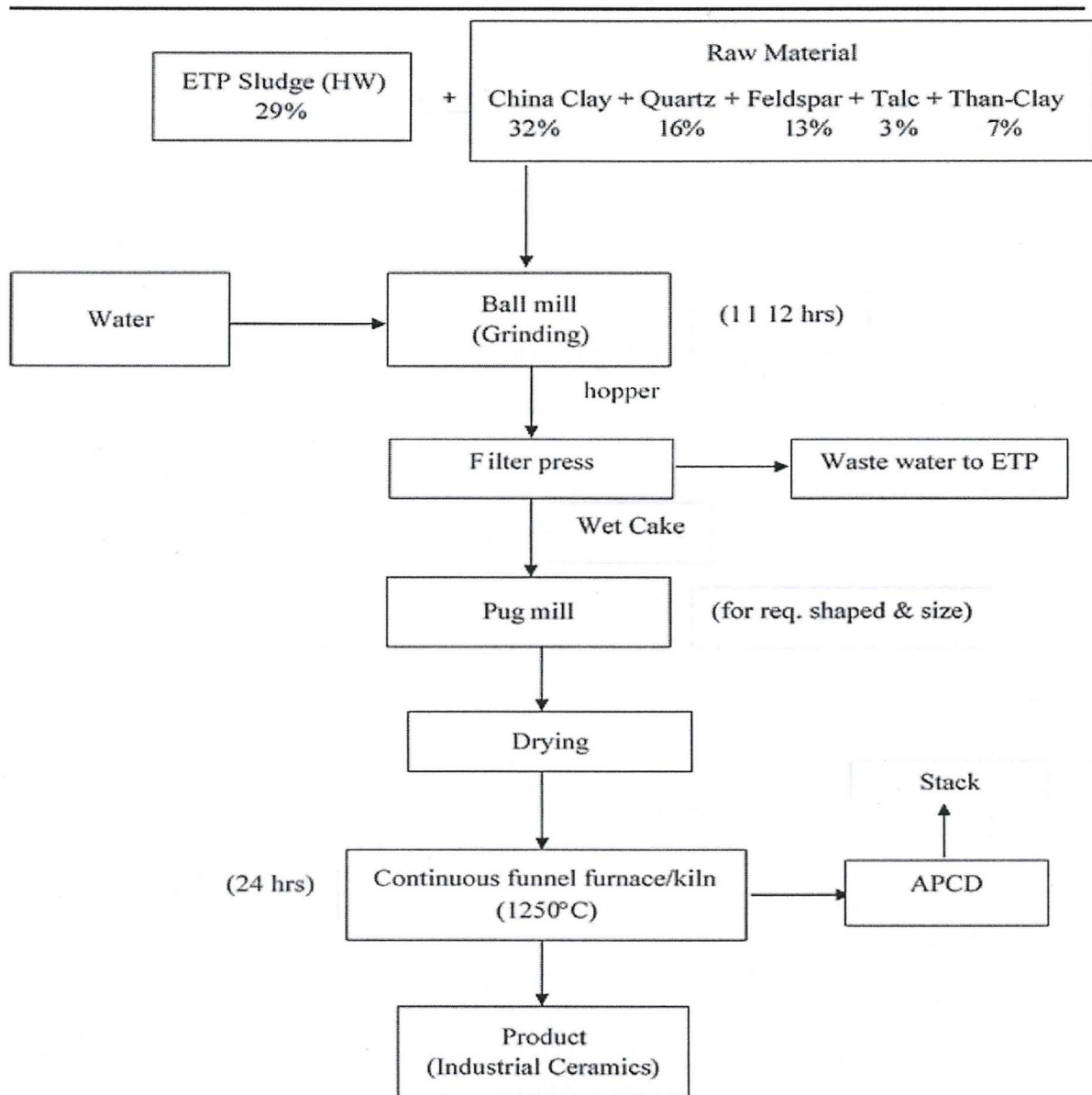


Figure 2: Process flow diagram for utilization of ETP sludge in manufacturing of Industrial Ceramics

81.3 Product Usage / Utilization

The ETP sludge will be utilized as partial raw material in the production of Ceramic Glaze Mixture and Industrial Ceramics.

The unit shall label its product (i.e. Ceramic Glaze Mixture and Industrial Ceramics) manufactured by utilizing aforesaid Hazardous waste as “This Ceramic Glaze Mixture /Industrial Ceramics has been manufactured by utilizing ETP sludge, generated during effluent treatment of ceramic industry.”

81.4 Standard Operating Procedure for utilization

This SoP is applicable only for the utilization of ETP sludge generated from wastewater treatment of ceramic industries. Any other sludge generated from ceramic industries such as tarry sludge from coal gasifiers, etc. are prohibited for utilization.

**Utilization of ETP Sludge generated from wastewater treatment of ceramic industries
in manufacturing of Ceramic products**

- 1) The ETP sludge shall be transferred to mixer and ball mill through mechanized system ensuring minimal manual intervention. In case of manual transfer of sludge to mixer and grinding mill, proper personal protective equipment (PPEs) such as mask, gloves, safety shoes and helmet shall be provided to the workers.
- 2) There shall be a designated storage space for ETP sludge and provided with caution sign. Floor of storage area shall be acid proof brick lining or concrete with low raise bund wall.
- 3) Utilization of ETP sludge shall not exceed 32 % as partial substitute of total raw material.
- 4) During utilization of ETP sludge in the furnace of ceramic glaze mixture production process, APCD for proper treatment of SO_x shall be installed.
- 5) Air blower shall be provided to reduce the temperature of escaping flue gas through stack. Heat recovery system may be explored in consultation with SPCB/PCC, if any.
- 6) The unit shall provide oil-gas separator to avoid mixing of oil with natural gas before it enters in furnace. Furnaces using fuel other than natural gas shall not be permitted for utilization of ETP sludge in manufacturing of ceramic glaze mixture and industrial ceramic without taking approval of CPCB.
- 7) The unit shall ensure final product quality may not be degraded by utilization of ETP sludge.
- 8) The treated gases shall comply with emission norms prior to dispersion into atmosphere through stack. The stack height shall be a minimum of 30 m from ground level or as prescribed by the concerned SPCB/PCC, whichever is higher.
- 9) Treatment and disposal of wastewater:
Waste water generated from floor-washings, spillages, filter press, etc. shall be treated Physico-Chemically in an ETP so as to comply with inlet standards prescribed in case of CETP or be treated in captive ETP having adequate treatment facilities to comply with surface water discharge standards as stipulated in the Consent issued by the SPCBs/PCCs. In case of zero discharge condition, the treated waste water from ETP may be managed as per conditions stipulated by the SPCB/PCC.
- 10) The hazardous wastes generated (if any) during utilization process shall be collected and temporarily stored in non-reactive drums under a dedicated hazardous waste storage area and be sent to authorized common TSDF or other authorized facility within 90 days from generation of the waste in accordance with the authorization issued by the concerned SPCB/PCC. Such storage shall be done under covered storage area with proper ventilation.
- 11) Prior to utilization of ETP sludge, the unit shall obtain authorization for generation, storage, and utilization from the concerned SPCB/PCC under HOWM Rules 2016.
- 12) The unit shall maintain proper ventilation in the work zone and process areas. All personnel involved in the plant operation shall wear proper PPEs specific to the process operations involved and type of chemicals handled as per MSDS. The safety precautions of the worker shall be in accordance with the Factory Act, 1948, as amended from time to time.



**Utilization of ETP Sludge generated from wastewater treatment of ceramic industries
in manufacturing of Ceramic products**

- 13) 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.
- 14) The unit shall provide suitable fire safety arrangements and flame proof electrical fittings.
- 15) During the process of utilization and handling of hazardous waste, the unit shall comply with requirements in accordance with the Public Liability Insurance Act, 1991 as amended, wherever applicable.

81.5 Record>Returns Filing

- 1) The unit shall maintain a passbook issued by the concern SPCB/PCC and maintain details of each procurement of ETP sludge 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 generation/procurement of ETP sludge, quantity, date wise utilization of ETP sludge, quantity of ceramic glaze mixture and industrial ceramic manufactured, hazardous waste generation and its disposal, etc. shall be maintained including analysis report of 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 annual returns in Form 4 as per Rule 20 (1) and (2) of HOWM Rules, 2016.
- 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.

81.6 Standards

- 1) Source emission monitoring from the stack attached to APCD of furnace and tunnel kiln shall comply with the following emission standards or as prescribed by the concerned SPCB/PCC, whichever is stringent;

PM	150 mg/Nm ³
SO ₂	100 ppm
NO _x	50 ppm
Heavy Metals (As+, Pb+, Cr+, Co+, Cu+, Mn+, Ni+)	0.5 mg/Nm ³
TOC	20 mg/Nm ³

**Utilization of ETP Sludge generated from wastewater treatment of ceramic industries
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2) Fugitive emission in the work zone shall comply with the following standards:

PM ₁₀	5.0 mg/m ³ TWA*
SO ₂	13 mg/m ³
NO _x	9 mg/m ³
Silica	10 mg/m ³

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

3) Monitoring of the specified parameters for source emission shall be carried out quarterly for the first year followed by at least annually in the subsequent year of utilization. Fugitive emission for specified parameters shall be carried out quarterly. 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.

81.7 Siting of Industry

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

81.8 Size of Plant & Efficiency of utilization

2 MT of raw material including 0.64 MT of ETP sludge may yield 1.735 MT of ceramic glaze mixture i.e. 86.75% yield with 13.25% of loss in furnace.

0.965 MT of raw material including 0.28 MT of ETP sludge may yield 0.82 MT of industrial ceramic i.e. 84.98% yield with 15.02% of loss in tunnel kiln.

81.9 On-line detectors / Alarms / Analysers

Online emission monitoring systems shall be installed in case of continuous process operations for PM, NO_x and SO₂ and connected to the server of concerned SPCB/PCC and CPCB.

81.10 Checklist of Minimal Requisite Facilities

S. no.	Particulars
1.	Cool, dry, well-ventilated ETP sludge storage area with caution sign and low raise bund wall.
2.	Mechanized system for transfer of ETP sludge from storage area to mixer & ball mill.
3.	Mixer, hopper, furnace
4.	Ball mill, Filter press, pug mill and continuous tunnel furnace/kiln.
5.	Cooling water, Air blower
6.	Oil gas separator to avoid mixing of oil with natural gas before it enters furnace.
7.	De-dust system and cyclones for dust collection in work zone near raw material charging point i.e. mixer, furnace and ball mill.
8.	Suction arrangement to channelize emissions from furnace and tunnel kiln to APCD and finally to the stack of height 30m or as prescribed by the SPCBs/PCCs.
9.	Effluent treatment plant.
10.	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.
