

PROJECT TITLE	OVERALL PAGE
INVITATION OF EOI FOR DESIGN, ENGINEERING, SUPPLY, CONSTRUCTION/INTEGRATION, INSTALLATION, ERECTION, COMMISSIONING, TESTING & TRIAL RUN OF SPENT POTLINING (SPL)-CARBON TREATMENT PLANT- UNDER BUILD-OPERATE-TRANSFER (BOT) CONTRACTS FOR FIVE YEARS	1 of 17

National Aluminium Company Limited (NALCO), one of the largest Aluminium producers in India having its Corporate Office at Bhubaneswar and Smelter Plant at Angul of Odisha India invites Expression of Interest from interested parties to establish SPL (Carbon Portion) treatment plant of capacity 10000 MT/YR *under build-operate-transfer (BOT) contracts for five years*, inline with the Safe Operating Procedure of Central Pollution Control Board (CPCB) to have a product carbon having maximum concentration limits of

Cyanide –20 mg/l [Based on Toxicity Characteristic Leaching Procedure(TCLP)]

Fluoride –180mg/l [Based on Soluble Threshold Limit Concentration (STLC)]

From initial composition

- F 4–7 % by Wt.
- CN 400–800 mg/l

For more information please visit our website <http://www.nalcoindia.co.in/> & CPCB site [http://cpcb.nic.in/Spent\\_Pot\\_Lining\\_13.04.17.PDF](http://cpcb.nic.in/Spent_Pot_Lining_13.04.17.PDF)

Interested parties having experience in similar field may furnish their Expression of Interest with all the necessary documents in a sealed cover along with the covering letter duly signed by an authorized signatory on or before one month of date of publishing of this advertisement by 13:00 hours(IST) at the following address:

To

The AGM(ENVIRONMENT)

SMELTER PLANT,

NALCO, ANGUL

CIN: L27203OR1981GOI000920

Attn: **Abhijit Sinha**

Email: [abhijit.sinha@nalcoindia.co.in](mailto:abhijit.sinha@nalcoindia.co.in)

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**INVITATION FOR EXPRESSION  
 OF INTEREST (EOI)  
 FOR DESIGN, ENGINEERING,  
 SUPPLY, CONSTRUCTION/INTE  
 GRATION, INSTALLATION,  
 ERECTION, COMMISSIONING,  
 TESTING & TRIAL RUN OF  
 SPENT POTLINING (SPL)-  
 CARBON TREATMENT PLANT-  
*UNDER BUILD-OPERATE-  
 TRANSFER (BOT) CONTRACTS  
 FOR FIVE YEARS.***

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# Part I: General

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**1. BRIEFS ABOUT NALCO:** National Aluminium Company Limited (NALCO) is one of the largest Aluminium and Alumina producers in India having its Corporate Office at Bhubaneswar and Alumina Refinery & Bauxite Mines at Damanjodi in the state of Odisha, India. Mines Division is the captive bauxite mine of NALCO situated on Panchpatmali hills at an elevation of 1300m above mean sea level near Damanjodi, in the district of Koraput, Odisha state, India. The mines have a capacity to produce 68.25 Lakh Tons per Annum of Bauxite. The bauxite is transported through hilly terrain by Cable Belt Conveyor System and then fed in Alumina refinery plant at Damanjodi for purification. The process of extraction of Alumina from its mineral bauxite in caustic liquor solution is commonly known as 'Bayer's Process'. Nalco's Alumina Refinery is, having a capacity of 22.75 Lakh Tons per Annum, is the lowest cost Alumina producer in the world, as per Wood Mackenzie report. The alumina produced is used to meet Company's requirement for producing primary aluminium at its Smelter Plant, located at Angul, Odisha and the surplus alumina is exported to overseas market. At its Smelter Plant, having a capacity of 4.6 Lakh Tons per Annum, alumina is converted into primary aluminium through a smelting process by using AP18 smelting technology. The plant has integrated facilities for manufacturing standard and alloy ingots, T-ingots, billets, wire rods, rolled products and chequered sheets. The product is sold in domestic/ international market. To meet the power demand of the Smelter Plant, NALCO has its own Captive Power Plant, 10X120 MW capacity at Angul. More details on NALCO can be viewed on company's website [www.nalcoindia.com](http://www.nalcoindia.com).

## 2. Objective Of THIS EXPRESSION OF INTEREST (EOI)

Spent potlining (SPL) is a waste generated in the primary aluminium smelting process. Primary aluminium is produced by the electrolysis of alumina in Hall- Heroult electrolytic reduction in pots at 960° C using carbon anodes and a mixture of molten cryolite ( $\text{Na}_3\text{AlF}_6$ ) with alumina & other additives. The pot is provided with electrolically conductive carbon lining acting as cathode. After expiry of the life span of the pot cells i.e. around 3 to 6 years the refractory of the pot cells needs replacement. This waste lining is termed as Spent Pot lining (SPL) which is categorized as hazardous Waste at sl. no. 11.2 of Schedule-I of Hazardous & Other Waste Rules 2016.

The delined material consists of carbon portion, known as first cut & refractory portion called 2nd cut. A typical proportion of carbon & refractory in 55% & 45 % respectively.

**Through this EOI NALCO intends to finalise the Term Of Reference (TOR) of the project for subsequent tendering action based on discussion with / feedback from the participated agencies.**

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### 3. TENTATIVE CALENDAR OF EVENTS

The following table enlists important milestones and timelines for completion of bidding activities:

Sl. No	Milestone	Date
1.	Release of Expression of Interest (EOI) Invitation	0 Date (Date of publishing in the Newspaper)
2.	Last date for submission of written questions/query by participants if any	2 WEEKS (from Date of publishing in the Newspaper)
3.	Last date for Submission of EOI Response	4 WEEKS (from Date of publishing in the Newspaper)
4.	Response to the Queries	Within 4 days of submitting the written question/query
5.	Opening of EOI Responses	30 days (from Date of publishing in the Newspaper)
6.	Meeting with EOI respondent (Optional)	Within 30 days of opening of EOI

### 4. AVAILABILITY OF THE EOI DOCUMENTS

EOI can be downloaded from the NALCO website given under Section\_”Business > Material & Procurement > EOI.” The participants are expected to examine all instructions, forms, terms, project requirements and other details in the EOI documents. Failure to furnish complete information as mentioned in the EOI documents or submission of a proposal not substantially responsive to the EOI documents in every respect will be at the participant’s risk.

### 5. PARTICIPANTS’ MEETINGS

A meeting as regards to any clarification required for this project may be arranged between participant and owner at Smelter plant NALCO Angul, Odisha, India at a suitable time and date mutually agreed by participant and owner within 30 days of opening of EOI . It is advisable that the representatives of the interested organizations may attend the meeting at their own cost, **though it is not mandatory**. The purpose of the meeting is to provide participants with any clarifications regarding the project. It will also provide each bidder with an opportunity to seek clarifications regarding any aspect of the project. Otherwise if required video conferencing can be arranged for interested bidders at a suitable time and date mutually agreed. The meetings and video conferencing will be co-ordinated on behalf of the owner by the contact persons.

### 6. VENUE & DEADLINE FOR SUBMISSION OF PROPOSALS

Proposals, in its complete form in all respects, must be submitted to NALCO at the address specified above at page 1 of this document. NALCO may, in exceptional circumstances and at its discretion, extend the deadline for submission of proposals by issuing an addendum to be made available on the NALCO’s website, in which case all rights and obligations of NALCO and the bidders previously subject to the original deadline will thereafter be subject to the deadline as extended.

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## Part II: Term Of Reference for the Project

The Term of Reference (TOR) given below is for enabling the participants to submit their response for EOI. This TOR in no case is to be presumed as final for Request for Quotation (RFQ).

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### 1. Background:

The Central Pollution Control Board has published March'17 the Standard operating procedure & check list of minimal requisite facilities for utilization of spent pot lining as energy & resource recovery.

### 2. OBJECTIVE OF THE PROJECT

As a part of Nalco's commitment towards good environment control, Resource conservation, the goal of the project is to detoxify hazardous constituents (e.g. Fluoride & Cyanide content) of Carbon SPL to a fuel carbon with concentration limit specified at the specification of product at cl. No. 32.4-(13) of SOP of CPCB (Attached at Annexure-1) along with compliance of the emission standards given at cl. No. 36.6 of the above mentioned SOP so that the product can be used as fuel in cement plants.

### 3. TECHNICAL SPECIFICATION

The technical specifications mentioned below are the requirement proposed by Nalco. However, the participants through this EOI may propose for SPL carbon treatment System of latest and improved version suitable for NALCO Smelter and inline with SOP of CPCB (annexure-1). If required the participants shall visit the site, make appropriate study, understand, assess the requirement and propose the most suitable technical options. **The final technical specifications for Request for Quotation (RFQ) will be prepared based on the technical options proposed by the participants and the deliberations there of.**

#### 3.1 Layout

The equipments are to be installed inside the existing Smelter plant premises in any suitable vacant place. The layout will primarily depend on type of equipment selected; the participants may assess site condition and suggest their own layout suiting to their scheme. The lay out is to be envisaged by taking into account operational, maintenance ease, minimal logistics, less shutdown time and better utilization of present available space etc. If required capacity of bins/ hoppers, design or layout can be chosen suitably without affecting the final product. These alterations are in the scope of the participants. Environmental impact of noise, dust emission & effluent generation must be taken into account while designing of the equipments.

#### 3.2 Constructional Features:

The proposed system shall be a complete integrated unit that includes but not limited to Minimum requisite facilities ( given in Cl. No. 32.10 of SOP published by CPCB during March 2017 (attached in Annexure-1). [http://cpcb.nic.in/Spent\\_Pot\\_Lining\\_13.04.17.PDF](http://cpcb.nic.in/Spent_Pot_Lining_13.04.17.PDF)) along with Piping, Structural and complete electrical system and accessories like drives , MCC, etc. and complete automation and instrumentation system including PLC, panel view, SCADA etc. required for the complete system.

### 4. SCOPE:

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4.1 **BIDDERS SCOPE:** The project will be on LSTK basis and the scope shall include the following at the least

- Site assessment and conceptualization of the project within battery limits,
- Collection of required data/inputs and submission of design options for acceptance & approval.
- Manufacture / integration – supply- dispatch, installation, erection of SPENT POTLINING (SPL)-CARBON TREATMENT PLANT
- Statutory approval from relevant governing body.
- Testing, commissioning, performance and process guarantee, PG test.
- The supplied system shall be a complete operating unit including all required auxiliary equipment for efficient and satisfactory operation as a whole. Vendor shall be responsible for furnishing all mechanical, electrical, instrumentation, civil and other inter-connecting and safety items as required to make the system complete. The job needs to be carried out in minimum possible time.
- All the equipments and materials supplied and installed shall be installed in accordance with sound designing and engineering principles and good fabrication and construction practices.
- All the electrical and instrumentations required for supply, installation, testing and commissioning and running of the proposed System for a period of five years, shall be in vendor's scope.
- The civil and structural work shall include but not limited to, foundation of all the supplied equipments, dismantling of required existing structures (if any), installation of new structural members for locating the machine, concreting, roofing, foundation preparation, construction of temporary and permanent shed, equipment protection barriers, extension /remodelling/ construction of MCC/PLC rooms if required etc.
- Civil works include all required civil and structural works, equipment foundation, grouting, opening in walls, sheeting, hooding, reinforcements, etc including supply of materials required for successful completion of the project. Fabrication and erection of new supporting structural for SPL treatment System, strengthening of structures.

**The above scope of work and services and the battery limit is just an outline to give an idea to vendors interested for EOI about the involvement of work and services. This in no case is to be presumed as final for Request for Quotation (RFQ). The final scope, battery limit and technical specifications will be more elaborate covering many other aspects of the project while inviting RFQ**

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#### 4.2 NALCO'S SCOPE

NALCO will provide cooling water, compressed air , fire water at pre defined battery limit.

Free Land, Water and Electricity on chargeable basis at site for temporary office cum store cum warehouse cum work shop for smooth execution of the project. However vendor has to provide necessary tapping connections from the source identified by Nalco.

Provision of general illumination of the area will be in NALCO's scope. However illumination required specifically for the proposed System shall be in vendor's scope of supply and works. Illumination required at construction site shall be the scope of vendor.

#### 5. BATTERY LIMIT:

The battery limits for the project are the free land limit given by NALCO for the project and the designated storage space for the detoxified carbon material.

#### 6. BUSINESS MODEL:

The vendor will DESIGN, ENGINEERING, SUPPLY, CONSTRUCTION/INTEGRATION, INSTALLATION, ERECTION, COMMISSIONING, TESTING & TRIAL RUN OF SPENT POTLINING (SPL)-CARBON TREATMENT PLANT .

The vendor will operate the plant for five years

During operational phase Nalco will supply coarsely segregated carbon portion of SPL (Size 200 to 500mm) as feed, free of cost.

The treated detoxified carbon fuel will be handed over to NALCO at a cost to be offered by vendors at the time of bidding.

After five years the system to be handed over to NALCO at a cost to be offered by vendors at the time of bidding.

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## Part III: EOI Application Terms

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## 1. CONDITIONS UNDER WHICH THIS EOI IS ISSUED

- i. This EOI is not a commercial offer and is issued with no commitment.
- ii. NALCO reserves the right to withdraw this EOI if NALCO determines that such action is in the best interest of the organization.
- iii. The Term of Reference (TOR) given above is for enabling the participant to submit their response for EOI. This TOR in no case is to be presumed as final for Request for Quotation (RFQ). Technical discussion will be held with the responded parties so as to decide upon the term of reference of the Project in line with the requirement of the project. Modalities and time for the discussion will be intimated to the responded parties at a later date. Based on the discussion with the responded parties a more detailed and elaborate TOR will be prepared covering all aspect of the project.
- iv. Timing and sequence of events resulting from this EOI shall ultimately be determined by NALCO.
- v. No oral conversations or agreements with any official, or employee of NALCO shall affect or modify any terms of this EOI and any alleged oral agreement or arrangement made by a participants with any department, official or employee of NALCO shall be superseded by the definitive agreement that results from this EOI process. Oral communications by NALCO to participants shall not be considered binding on NALCO, nor shall any written materials provided by any person other than NALCO.
- vi. Neither the participant nor any of the participant's representatives shall have any claims whatsoever against NALCO or any of their respective officials or employees arising out of, or relating to this EOI or these procedures.
- vii. Each applicant shall submit only one proposal.

## 2. RIGHTS TO THE CONTENT OF THE PROPOSAL

For all the EOI documents received before the last date and time of submission and accompanying documentation will become the property of NALCO and will not be returned after opening of the proposals.

## 3. ACKNOWLEDGEMENT OF UNDERSTANDING OF TERMS

By submitting a proposal, each participant shall be deemed to acknowledge that it has carefully read all sections of this EOI, including all forms, schedules and annexure hereto, Expression of Interest and has fully informed itself as to all existing conditions and limitations.

## 4. LANGUAGE OF PROPOSALS

The proposal and all correspondence and documents shall be written in English.

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## 5. Response Requirements

- i. The Response to the EOI Requirements shall be prepared in accordance with the requirements specified in this EOI document and in the format prescribed in this document.
- ii. Proposals must be direct, concise, and complete. All information not directly relevant to this EOI should be omitted.
- iii. The EOI Proposal shall be sealed and super scribed “Response to EOI Requirements – SPENT POTLINING (SPL)-CARBON TREATMENT PROJECT” on the top right hand corner and addressed to NALCO at the address specified for bid submission in this document.
- iv. The proposal should contain the copies of references and other documents as specified in the EOI.
- v. NALCO will not accept delivery of EOI proposal in any manner other than that specified in this document. Proposal delivered in any other manner shall be treated as defective, invalid and rejected.

## 6. REQUIREMENTS FOR THE PROPOSAL

The EOI Proposal should be submitted in the sealed envelope with the following details. Participants are requested to submit their responses for the EOI clearly labeled according to the following categories:

- a. Part 1-Covering Letter : Covering Letter from the Bidder as per the format provided in Annexure – Form I
- b. Part II – Details of the Organization
  - i. This part must include a general background of the respondent organization (limited to 400 words) along with other details of the organization as per the format provided in the EOI (Annexure – Form II).
  - ii. The participant must also provide the financial details of the organization as per format provided in the EOI (Annexure – Form III). Enclose the mandatory supporting documents listed in format.
- c. Part III – Participant must provide details of the proposal as asked in the format at Form-IV & V .

## 7. OPENING OF EOI PROPOSAL:

7.1The EOI offers shall be opened at office of the AGM(ENV).

7.2 NALCO reserves the right to extend EOI opening date. In case of extension of EOI opening date, the same shall be hosted in NALCO Website/ CPP Portal and also intimation shall be given to participants, who would have submitted their offers within the due date.

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## 1. FORM I: COVERING LETTER

(Company letterhead)

[Date]

To,  
SRI ABHIJIT SINHA,  
ASST. GENERAL MANAGER(ENV),  
SH&E DEPARTMENT, SMELTER,  
NALCO, ANGUL-759145,

Ref: Expression of Interest No. NAL-SMLT-SPL-2017\_01

Dear Sir,

Having examined the Expression of Interest (EOI), I/we, the undersigned, on behalf of our company intend to participate in SPENT POTLINING (SPL)-CARBON TREATMENT Project and submit a proposal in response to the Expression of Interest (EOI) for the said project. We attach hereto the response as required by the EOI, which constitutes our proposal. Primary and Secondary contacts for our company are:

	Primary Contact	Secondary Contact
Name:		
Title:		
Company Name:		
Address:		
Phone:		
Mobile:		
Fax:		
E Mail:		

I/We confirm that the information contained in this response or any part thereof, including its exhibits and other documents is true, accurate, verifiable and complete. We fully understand and agree to comply that on verification, I/We also understand that incorrect information furnished in this process shall render the proposal liable for **rejection at** any stage. Our Company agrees for acceptance of all the terms and conditions set out in the EOI document. It is hereby confirmed that I/We are entitled to act on behalf of our company/ corporation/ firm/ organization and empowered to sign this document as well as such other documents, which may be required in this connection.

Dated this.....Day of.....2018

(Signature) and Seal of Company (In the capacity of) (Name)  
(Name)

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## 2. FORM II: GENERAL DETAILS OF THE ORGANIZATION

Details of the Organization

Name of organization

Nature of business

Date of Incorporation

Date of Commencement of Business

Address of the Headquarters

Address of the Registered Office in India if any

Other Relevant Information : GSTN NO. PAN NO. ETC.

## 3. FORM III: FINANCIAL DETAILS OF THE ORGANIZATION

Financial Information			
	FY 2014-15	FY 2015-16	FY 2016-17
Revenue			
Profit Before Tax			
Profit after Tax			
Other Relevant Information			

**FORM IV:** a) Details of existing treatment process installed / operated by bidder (if any)  
b) Proposed treatment process details.

## FORM V: Questionnaire

Sl.	Description	Proposed system	Remarks
1.	Is the treatment process is similar to the process given in the SOP of CPCB ( at Annexure-1)		(If no please give details. )
2.	Minimum requisite facilities given in Cl. No. 32.10 in the above SOP are taken care in the proposal.		(if no what are the deviations)
3.	Capacity of the plant		Mention the rated capacity /day or per batch

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4.	Capacity of crusher, kiln etc.		
5.	Type of pollution control equipment attached		
6.	Requirement of land		
7.	Requirement of power		
8.	Requirement of water		
9.	Requirement of compressed air		
10.	Type & Quantity of Raw material required		
11.	Type & Quantity of waste generated & disposal procedure.		
12.	Details of Leachate treatment facility		
13.	Type of payment terms		
14.	Guarantee conditions/PG test parameters w.r.t. cl. No. 32.4.13 and 32.6 of SOP at Annexure-1		

Note:

- 1) This proforma duly filled in, stamped and signed shall be submitted along with the proposal.
- 2) The participant shall also ensure that all information asked for is furnished and the same is correct and complete in all respect.
- 3) For the referred installations mentioned at form-IV (a) the participant shall indicate the name of the user's contact person (along with his address, telephone no., fax no., e-mail id etc.) who may be contacted by, if necessary.
- 4) The participant may also furnish along with the proposal his standard reference list for the offered equipment/package.

Signature of participant with date & seal:



PROJECT TITLE	OVERALL PAGE
INVITATION OF EOI FOR DESIGN, ENGINEERING, SUPPLY, CONSTRUCTION/INTEGRATION, INSTALLATION, ERECTION, COMMISSIONING, TESTING & TRIAL RUN OF SPENT POTLINING (SPL)-CARBON TREATMENT PLANT- UNDER BUILD-OPERATE-TRANSFER (BOT) CONTRACTS FOR FIVE YEARS	17 of 17

# Annexure 1

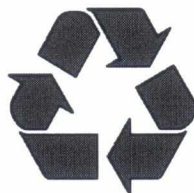
STANDARD OPERATING PROCEDURE & CHECKLIST OF MINIMAL REQUISITE FACILITIES FOR UTILISATION OF HAZARDOUS WASTE UNDER RULE – 9 OF THE HAZARDOUS & OTHER WASTE MANAGEMENT & TRANSBOUNDARY MOVEMENT RULES, 2016

UTILISATION OF SPENT POTLINING (SPL) GENERATED FROM PRIMARTY ALUMINIUM SMELTING PROCESS.

 <b>नालको NALCO</b> SMELTER DIVISION	DOCUMENT TITLE	DOCUMENT	REVISION	DOC. PAGE
		INVITATION OF EOI	NAL-SMLT-SPL-2017_01	1

**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 Pot Lining (SPL) generated from Primary Aluminium Smelting Industries**



**cpcb**

March, 2017

**Central Pollution Control Board**  
(Ministry of Environment, Forest & Climate Change, Government of India)  
**Parivesh Bhawan, East Arjun Nagar,**  
**Shahdara, Delhi – 110032**

**Procedure for grant of authorisation by SPCBs/PCCs for utilization of Hazardous Waste**

- (i) While granting authorisation for utilization of hazardous wastes, SPCBs/PCCs shall ensure the following:
  - a. The waste (intended for utilization) belongs to similar source of generation as specified in Standard Operating Procedures (SoPs).
  - b. The utilization process is similar to the process of utilization described in SoPs.
  - c. End-use / product produced from the waste shall be same as specified in SoPs.
  - d. Authorisation be granted only after verification of utilization process and minimum requisite facilities as given in SoPs.
  - e. Issuance of passbooks (similar to the passbooks issued for recycling of used oil, waste oil, non-ferrous scrap, etc.) for maintaining records of receipt of hazardous wastes for utilization.
- (ii) After issuance of authorization, SPCB/PCC shall verify the utilization process, checklist and SOPs on quarterly basis for initial 2 years; followed by random checks in the subsequent period for atleast once a year.  
 In-case of lack of requisite infrastructures with the SPCB/PCC, they may engage 3<sup>rd</sup> party institutions or laboratories having EPA/NABL/ISO17025 accreditation/recognition for monitoring and analysis of prescribed parameters in SoPs for verification purpose.
- (iii) SPCBs/PCCs shall provide half yearly updated list of units permitted under Rule 9 of HOWM Rule, 2016 to CPCB and also upload the same on SPCB website, periodically. Such updated list shall be sent to CPCB half yearly by July and January respectively.
- (iv) Authorisation for utilisation shall not be given to the units located in the State/UT 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.
- (v) In case 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.
- (vi) 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.

**32.0 Utilization of Spent Pot Lining (SPL):**

<b>Type of HW</b>	<b>Source of generation</b>	<b>Recovery/Product</b>
Spent Pot Lining(SPL) - Category 11.2 of schedule-I of HOWM Rules, 2016	During production of Primary Aluminium from Alumina Smelting Industries	For manufacturing of Carbon Mineral Fuel to be used as resource/energy recovery in cement kiln

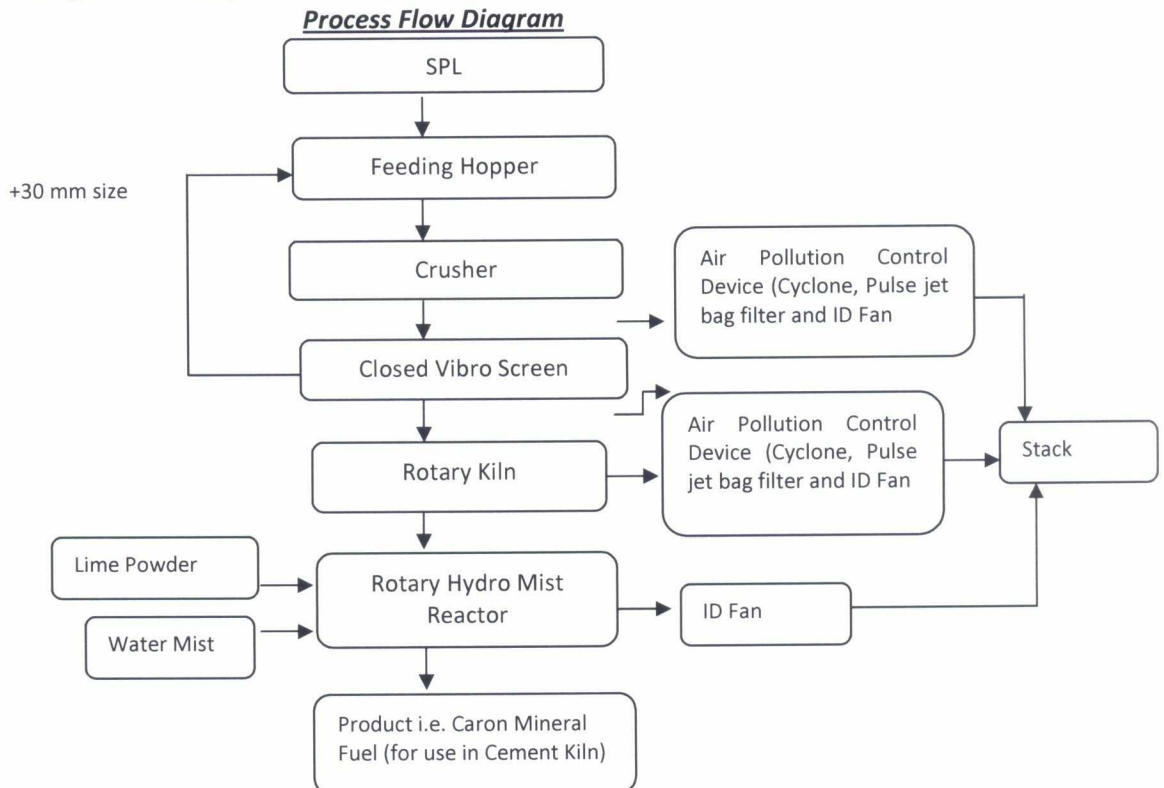


**32.1 Source of Waste**

Spent Pot Lining (SPL) is a waste generated in the primary aluminium smelting industries. Primary aluminium is produced by the electrolysis of alumina in Hall-Heroult electrolytic reduction pots at 960°C using carbon anode and a mixture of molten Cryolite (Na<sub>3</sub>AlF<sub>6</sub>) with 28% of dissolved alumina (Al<sub>2</sub>O<sub>3</sub>) and other additives. The reduction pot is provided with electrically conductive carbon linings for electrolyzing the molten electrolyte by passing an electric current between carbon anode dipped into the molten bath whereas the carbon lining acting as cathode. The outer pot-linings consist of refractory material enclosed in a steel pot-shell. Cells of this type have a typical life span of 3 to 6 years. During pot operation, carbon lining gradually deteriorate with slow penetration of molten melt. The lining gets deteriorated and the continued operation of the cells demands replacement of pot-lining. This replaced pot lining is termed as Spent Pot Lining (SPL) which is categorised as hazardous waste at S.No.11.2 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/resource recovery. Typical spent pot lining contains carbon (60-75%), SiO<sub>2</sub> (1-2%), Al<sub>2</sub>O<sub>3</sub> (7-8%), Fe<sub>2</sub>O<sub>3</sub> (1-2%), Na (7-11%), Fluoride (4-7%) and Cyanide (100-250 ppm).

**32.2 Utilization Process**

The utilization process involves crushing of SPL (of size 200 mm-500 mm received from generator) in crusher followed by screening (30mm). The screened (-30mm) SPL is subjected to heat treatment in a rotary kiln at 430-460°C for cyanide destruction. The heat treated SPL is fed directly to the rotary hydro mist reactor along with lime and controlled water mist to convert the leachable fluoride into non-leachable CaF<sub>2</sub>. Resultant mass from the reactor is collected and packed in bags as finished product termed as Carbon mineral fuel to be used in cement kiln.



### 32.3 Product Usage / Utilization

Treated Spent Pot Lining (SPL) named as carbon mineral fuel shall be used as resource/energy recovery in cement kiln. Such cement kiln shall comply with the emission standards notified vide notification G.S.R. 497 (E) dated 10/05/2016 under Environment Protection Act, 1986.

### 32.4 Standard Operating Procedure (SoP) for utilization

This SoP is applicable only for the utilization of spent pot lining (SPL) generated from primary aluminium smelting industries.

- (1) The SPL of size 200-500 mm shall be transported in covered container mounted on vehicles fitted with requisite safeguards ensuring no spillage of waste in accordance with provisions stipulated under Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016.
- (2) Transportation of SPL shall be carried out by the sender (generator) or receiver (utilizer) as per the authorization issued by concerned SPCB under the Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016.
- (3) The sender and receiver shall ensure that procured SPL should be carboneous fraction of SPL and free from refractory material.
- (4) The unit shall store SPL under cool, dry and well-ventilated covered storage shed(s) within premises having impervious RCC flooring, as authorized by the concerned State Pollution Control Board/Pollution Committee under Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016, so as to eliminate rain water intrusion.

There shall be a designated space for unloading of SPL within the said covered storage shed(s).

- (5) Breaking and loading of large chunks (200-500 mm) of SPL to hopper shall be done through mechanical breaker/loader within the premises.
- (6) From feeding hopper, the chunked SPL shall be conveyed to enclosed crushing chamber system to hopper through a closed conveyer.
- (7) The SPL from said hopper shall be crushed in crusher (suitably designed to crush SPL which has high crushing index) and be screened to less than 30 mm size through vibro double deck screen. The oversized SPL shall be again fed to the hopper of crushing chamber through closed conveying system.
- (8) The entire system of crushing and screening shall be in a closed system. Such closed system shall be maintained under negative suction and be connected to cyclone, pulse jet bag filter and ID fan followed by stack of height as prescribed by concerned SPCB/PCC.



**Standard Operating Procedure and Checklist of Minimal Requisite Facilities - Utilization of Spent Pot Lining (SPL) generated from Primary Aluminium Smelting Industries**

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- (9) The screened SPL (of size less than 30 mm) shall be transferred to rotary kiln for direct heat treatment maintaining temperature not less than 430°C. The flue gas from rotary kiln shall be treated in separate system of cyclone, pulse jet bag filter and ID fan followed by individual/ common stack of height as prescribed by concerned SPCB/PCC.
- SPL shall be fed into the rotary kiln through automatic feeding system with electronic control panel to control the feed rate.
- (10) Heat treated SPL shall be fed into a rotary hydro mist reactor through a closed chute in red hot condition along with lime and controlled water mist. Retention time in rotary hydro mist reactor shall be maintained as 15-20 minutes. Rotary Hydro mist reactor shall be connected through ID fan connected to an individual /common stack of height as prescribed by concerned SPCB/PCC.
- (11) There shall be automated system (may operate under gravitational force from lime hopper) for lime powder addition into the reactor. High pressure nozzles with pump arrangement shall be used for water mist formation to be added in the reactor. Water tank with water flow meter and emergency re-circulating tank shall be connected with hydro mist reactor.
- (12) The rotary hydro mist reactor shall have an arrangement of hood over it for collection of fumes. Such hoods shall be maintained under suction through ID fan and be connected individual /common stack of height as prescribed by concerned SPCB/PCC.
- (13) Product i.e. carbon mineral shall meet the following concentration limits based on Toxicity Characteristic Leaching Procedure (TCLP)/Soluble Threshold Limit Concentration (STLC) as specified in Schedule II of HOWM Rules, 2016;
- Cyanide -20mg/l [Based on TCLP]  
Fluoride -180mg/l [Based on STLC]
- (14) Residue collected from cyclone and pulse jet bag filter shall be re-used in the utilization process.
- (15) 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 such as goggles; face mask, gloves, gum boot etc.
- (16) The unit shall provide suitable fire safety arrangements and flame proof electrical fittings.
- (17) It shall be ensured that spent pot lining is procured from the industries who have valid authorization for generation/storage of the same from the concerned SPCB/PCC as required under Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.
- (18) Prior to utilization of spent pot lining, the unit shall obtain authorization for generation, storage and utilisation of Spent Pot Lining from the concerned State Pollution Control

**Standard Operating Procedure and Checklist of Minimal Requisite Facilities - Utilization of Spent Pot Lining (SPL) generated from Primary Aluminium Smelting Industries**

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Board under the Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016.

- (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 unit 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) During the process of utilization and handling of hazardous waste, the unit shall comply with the requirements in accordance with the Public Liability Insurance Act, 1991 as amended, wherever applicable.

**32.5 Record>Returns Filing**

- (1) 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.
- (2) The unit shall maintain a passbook issued by concerned SPCB wherein the following details of each procurement of SPL shall be entered:
  - Address of the sender
  - Date of dispatch
  - Quantity procured
  - Seal and signature of the sender
  - Date of receipt in the premises
- (3) A log book shall be maintained with information on source and date of procurement of SPL, quantity, date wise utilization of the same, hazardous waste generation and its disposal, etc.
- (4) The unit shall maintain record of hazardous waste utilised, hazardous waste generated and disposed as per Form 3 & shall file annual returns in Form 4 as per Rule 20 (1) and (2) of the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, to concerned SPCB.

**32.6 Standards**

- (1) Fugitive emissions in the work zone shall comply with following:
  - PM10-5mg/m<sup>3</sup> TWA
  - Ammonia-25ppm (18mg/m<sup>3</sup>)TWA  
-35ppm (27mg/m<sup>3</sup>) STEL
  - Fluoride as F-2.5mg/m<sup>3</sup>TWA
  - Cyanide as CN -5mg/m<sup>3</sup>TWA

**Standard Operating Procedure and Checklist of Minimal Requisite Facilities - Utilization of Spent Pot Lining (SPL)  
generated from Primary Aluminium Smelting Industries**

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*(Reference: Occupational Safety and Health Standards 1910:1000);*

*TWA - Time-weighted average*

*The Permissible Exposure Limit is 8-hour TWA.*

*STEL-short term exposure limit (measured for 15 minutes duration of exposure)*

(2) Emissions from common stack connected to rotary kiln and crushing & screening followed by APCD shall comply with the following:

- PM - 50mg/Nm<sup>3</sup>
- Total Fluoride-25mg/Nm<sup>3</sup>
- Hydrogen Fluoride-4mg/Nm<sup>3</sup>
- Ammonia-75mg/Nm<sup>3</sup>
- Hydrogen Cyanide-10mg/Nm<sup>3</sup>

(3) Monitoring of the specified parameters for source emission shall be carried out quarterly for the first year followed by atleast annually in the subsequent year of utilization. Fugitive emission for specified parameters shall be carried out quarterly. The monitoring shall be carried out by NABL accredited or EPA approved laboratories results shall be submitted to the concerned SPCB/PCC quarterly.

**32.7 Siting of Industry**

Facilities for processing of SPL shall preferably 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.

**32.8 Size of Plant & Efficiency of utilisation**

100 kg of SPL would produce 109.5 kg of treated SPL as carbon mineral fuel, which will be used as energy/resource recovery in cement kiln. Therefore, requisite facilities of adequate size of storage shed and other plant & machineries as given in para 32.10 below shall be installed accordingly.

**32.9 On-line detectors / Alarms / Analysers**

Online emission monitoring systems for PM emission should be installed in stacks attached to screening & crushing section and rotary kiln and the online data be connected to the server of the concerned SPCB/PCC and CPCB.

**32.10 Checklist of Minimal Requisite Facilities**

S. No.	Requisite Facilities
1.	Designated space for storage of SPL only under cool, dry, well-ventilated covered storage shed with concrete RCC flooring within premises, so as to eliminate water intrusion.
2.	Mechanized handling system for loading and unloading of spent pot lining



**Standard Operating Procedure and Checklist of Minimal Requisite Facilities - Utilization of Spent Pot Lining (SPL)  
generated from Primary Aluminium Smelting Industries**

3.	Closed Crushing and screening chamber with crusher, Double deck closed vibro screen (screen size 30mm) with cyclone, pulse jet bag filter and ID Fan followed by common stack of height as prescribed by SPCB/PCC.  The crusher shall be suitably designed to crush SPL which has high crushing index.
4.	Stack with 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.
5.	Rotary kiln with automated feeding system of SPL.
6.	Thermocouple in the rotary kiln along with temperature display system
7.	APCD (cyclone, pulse jet bag filter and ID Fan) with the rotary kiln. The outlet of APCD shall be attached common stack of height as prescribed by SPCB/PCC with easy access to port hole, for conducting stack monitoring.
8.	Closed conveying system for feeding of SPL into crushing & screening unit, rotary kiln and hydro mist reactor
9.	Rotary Hydro mist reactor with arrangement of hood over it for collection of fumes. Such hoods shall be maintained under suction through ID fan and be connected to an individual /common stack of height as prescribed by concerned SPCB/PCC with easy access to port hole, for conducting stack monitoring.
10.	Lime feeding tank, water tank and emergency re-circulating tank
11.	Separate hopper for lime powder with automatic control system.
12.	High pressure nozzles with pump arrangement for water mist formation in reactor. Water tank with valve for automatic control system for mist formation
13.	Separate storage shed/space for storage of product
14.	Online analyzers for PM emission monitoring in stack and the online data be connected to the server of the concerned SPCB/PCC and CPCB.

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