



**NATIONAL ALUMINIUM COMPANY LTD**  
Nalco Bhawan, Plot No: P/1, Nayapalli,  
Bhubaneswar-751013

**EXPRESSION OF INTEREST FOR  
R&D COLLABORATION/  
COMMERCIALIZATION OF TECHNOLOGY  
WITH NALCO**

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## **EXPRESSION OF INTEREST**

### **1. TITLE:**

Expression of Interest (EoI) for R&D Collaboration with NALCO including commercialization of process/ technology.

### **2. 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).

### **3. About R&D Activities of NALCO.**

National Aluminium Company Limited (NALCO) Research & Developmental activities are carried out by R&D dept at S&P Complex and M&R Complex of the Company along with a corporate level R&D department. NALCO is giving importance to R&D activity either by in-house effort or with in collaboration with National/ International Laboratories/ academic institutions/JNARDDC/IIT/NIT/Engineering Colleges/ CSIR Labs/ Other DSIR approved labs depending on the needs. NALCO in its pursuit towards organizational growth through sustained development in process, product and technology through research & development activity, is setting up new facilities at its NALCO Research and Technology Center (NRTC) and revamping its R&D Centres to have the state of the art research and development facility to be created progressively with a vision to: 'Set up world class, state of the art research and development facilities to enable NALCO to achieve excellence in process, product and technology in the field of Bauxites, Alumina, Aluminium and allied areas'. It is intended to carry out certain collaborative research work at NRTC, for which the facilities are being developed.

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#### 4. OBJECTIVE OF EoI:

NALCO is interested for collaborative study and commercialization of innovative technologies, established in the laboratory, bench or/and pilot scale, explore a suitable and commercialization of technologies developed through R&D study. The objective of this EoI is to shortlist interested bidders who are interested for various laboratory scale studies and commercialisation of technologies developed. Institutes having experience in the field of Bauxite/ Alumina/ Aluminium/ Power shall be preferred.

In view of the above this Expression of Interest (EoI) is being sought from different Universities, Central organizations etc. such as: IIT,NIT,CSIR, ICAR, ICMR, DRDO, JNARDDC, S&T and other National academic institutions or private institutions/ companies on the following areas.

#### **I. R&D STUDY AREAS PROPOSED:**

##### **MINES AND ALUMINA REFINERY RELATED:**

1. Red mud treatment and its utilization after neutralization on site for separation of iron oxide/ titanium oxide/ gallium/ alumina/rare earth for commercial use including its use for water purification.
2. Utilization of return water from Red Mud pond.
3. Use of red mud in various applications including for low cost water purifying candles etc
4. Purification/Polishing of Sodic Condensate (DM water contaminated with very low conc soda) generated at Alumina Refinery process for use as Boiler makeup water.
5. Development of process for high purity XXXN Hydrate/ Alumina.

##### **SMELTER AND POWER PLANT RELATED:**

6. Development of high purity aluminum with an objective to set up pilot production facilities at NRTC, Bhubaneswar.
7. Development of aluminium dross processing technology.
8. Development of Aluminium products for Infra/ Construction sector.
9. Development of Aluminium alloy for application in Transport and Aero Industries.
10. Alternate value added products from Rolling plant and Billet casting facility in NALCO's Smelter Plant.
11. Development of methods for increasing the conductivity of electrolytic bath.
12. Development of R&D Pilot casting facility for aluminium alloys such as Al-Li and other alloys for strategic applications.

##### **COMMON AREAS:**

13. Development & implementation of specialized energy saving motors in conveyors, agitators, pumps etc.

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14. Waste heat recovery in smelter/Refinery/ CPP for useful application.
15. Waste treatment that are generated from Alumina Refinery (Red mud), Smelter (SPL, Dross) & CPP (Fly ash) for recovery of any valuable/ non-hazardous product.
16. Development of heat recovery systems/ heat transfer applications using nano-technology at various locations in production areas to improve efficiency.
17. Application of nano technology/ nano materials for improvement of quality of processes/products.
18. Microbial Recovery of Alumina from Fly Ash.
19. Bio-beneficiation of Bauxite through bacteria desilication.
20. Innovative techniques for prevention of fire in Coal Yard.
21. Any other field in line with Vision and Mission of the Company (<http://www.nalcoindia.com>).

## II. Commercialisation of Technology:

Apart from the above studies, NALCO is also interested for commercialization of the following technologies developed through in-house/ in collaboration with other institutes.

1. Removal of cyanide from Spent Pot Line (SPL) for use of the carbon portion in cement or other industries.
2. Use of fly ash/pond ash for producing ceramic tiles.
3. Use of refractory portion of SPL in cement industry.
4. Development of Light Weight aggregates-Foam products.

The details of the technology shall be shared with the interested and qualified parties. A brief of the technology is attached as Annexure-5 for kind reference.

## 5. AVAILABILITY OF EoI DOCUMENTS:

The bidders may go through the EoI document for an overview of the scope of work, bidder's qualification criteria, other bidding terms and conditions etc.

- 5.1 Bidders should download the complete set of EoI documents which is available in the Tender Section of our website [www.nalcoindia.com](http://www.nalcoindia.com). EoI documents are also available in the website [www.eprocure.gov.in](http://www.eprocure.gov.in).
- 5.2 Bidders are requested to visit the above websites regularly for corrigendum towards any modification/ addition/ bid due date extension etc. for this EoI, since the same shall not be published in newspapers.

## 6. Criterion for participating in the Expression of Interest (EoI)/Bidder Qualification Criteria:

- i. The Govt organizations like IIT, NIT, CSIR, ICAR, ICMR, DRDO, JNARDDC, BARC, S&T Laboratories under Govt of India (GoI).

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- ii. Laboratory/R&D facilities of the organizations/ companies/ institutes in India that have been certified by Department of Scientific and Industrial research (DSIR) (Proof of valid certificate to be submitted) with positive net worth. For such Institutes financial details to be submitted in the format at **ANNEXURE-3**.
7. Applicants (Institute and PI) are requested to go through the following & submit required supporting documents.
- Experience of collaborative R&D Projects with National Labs/ International Labs/ PSU's/ Govt Agencies along with proof of document to be submitted including commercialization, if any.
  - The institute should furnish details about technical capability (facilities & experts), Intellectual Property Rights (Patent filed/granted), previous experience in R& D.
  - Institute may also submit any other information he desires to furnish on his own to supplement his capabilities pertaining to this EoI.
  - Applicant (any Director of the institute and PI) should not be under liquidation, court receivership or similar proceeding.
  - A certificate stating that the applicant or its Proprietor/ Partner(s)/ Director(s) of the firm/ organization have been convicted by a court of Law for an offence involving moral turpitude in relation to business dealings during the past seven (7) years. The applicant shall give an affidavit/ certificate to this effect. The affidavit/certificate must be affirmed before the competent judicial authority or duly notarized by the Notary. NALCO reserves the right to reject a proposal, if it is determined that any applicant participating in the EoI is engaged in corrupt and fraudulent work practice.
  - Combined proposal from two or more institutes/organizations may be accepted; however one of the institutes shall be nodal agency, the detail of scope of each institute is to be submitted along with the proposal.

**8. Other Conditions:**

- NALCO reserves the right to withdraw this EoI without notifying the reason.
- NALCO shall not be responsible for any expense incurred by the applicants in connection with the preparation and delivery of their applications or any other expenses incurred as regards the subject EoI.
- Telefax/ E-mail/ CD shall not be accepted unless accompanied by formal signed documents in hardcopy. NALCO takes no responsibility for delay, loss or non-receipt of document sent by Post/ Courier.
- The applicants may note that mere submission of application shall not entitle automatic qualification of the EoI application.
- NALCO does not guarantee taking up any collaborative R&D Projects.
- Application of EoI from any individual is not be acceptable.

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- Any R&D Projects if found suitable and shortlisted shall be processed for selection as per NALCO's approved procedure.
- An applicant requiring any clarification on the terms and conditions for this EoI may be sought and obtained from the designated official in writing or e-mail. The applicants must send their queries at least 7 days prior to the last date for submission of application. Clarification sought from/ obtained from anybody, other than the designated official shall not be entertained.
- Shortlisted parties may be called for presentation before the selection committee to be fixed by NALCO at their own cost.

## 9. SUBMISSION OF EOI PROPOSAL:

- 9.1 The offline bid due date for the EOI is **13<sup>th</sup> Nov'17, 13:00 Hrs. (IST)**.
- 9.2 The bidders are expected to examine all instructions, forms, terms, job 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 bidder's risk and may result in rejection of the proposal.
- 9.3 Interested parties are to submit their offers against this Expression of Interest offline along with all requisite details, documents, annexure etc. latest by the bid due date and time mentioned above. The hard copy of the EOI offer in sealed cover shall be sent by post in the following address so as to reach on or before the bid due date as mentioned at 9.1 above.

Mr.Partha Bandopadhyay, AGM (R&D),  
National Aluminium Company Limited,  
Nalco Bhawan,  
P/1, Nayapalli, Bhubaneswar,  
Odisha – 751013, INDIA  
E-mail: [partha.bandopadhyay@nalcoindia.co.in](mailto:partha.bandopadhyay@nalcoindia.co.in), Mob – 09437055216.

- 9.4 NALCO may, in exceptional circumstances and at its discretion, extend the deadline for submission of EOI offers by issuing an addendum to be made available on 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.
- 9.5 The hard copy of the EOI offers must contain the following documents:
- i. Covering Letter from the Bidder as per the format provided in **Annexure-1**.
  - ii. Original/ photocopy copy of certificates, affidavits, declarations, undertakings etc. asked for in the EOI documents.
  - iii. The bidders must provide details of relevant project experience, patents as per the format (**Annexure-4**) provided in the EoI documents along with the supporting documents.
  - iv. General details of their Organization (limited to 400 words) along with other details of the organization as per the format provided in **Annexure-2**.

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- v. Financial details of the Organization as per format provided in **Annexure-3**.
- vi. Documentary evidence by way of copies of Agreement/ work orders, work completion certificates, audited Annual Reports containing audited balance sheets, profit loss accounts statements for preceding 3 financial years, Corporate Undertaking etc. in support of fulfilling the qualification criteria mentioned in the EOI documents.

**9.6** NALCO reserves the right to complete the evaluation based on the details furnished in the bid without seeking any additional information/ documents.

**9.7** NALCO shall not be responsible for any postal delay and/or misplacement. Late and delayed offers will not be entertained.

**10. OPENING OF EoI PROPOSAL:**

**10.1** The EOI offers shall be opened at **15:30 Hrs. (IST) of 13<sup>th</sup> Nov, 2017.**

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

**11. SPECIAL CONDITIONS:**

- i. This EoI is issued by NALCO and is intended to only short-list potential innovative projects. NALCO’s decision with regard to the short-listing through this EoI shall be final and binding. NALCO reserves the right to reject any or all the proposals without any liability.
- ii. NALCO reserves the right to withdraw this EoI without any liability for such action if it determines that such action is in the best interest of the organization.
- iii. The details given above are for enabling the bidder to submit their response against the EoI. Timing and sequence of events resulting from this EoI shall ultimately be determined by NALCO.
- iv. 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 bidder with any department, official or employee of NALCO shall be superseded by the definitive agreement. Any oral communications or any written materials provided by any person other than the authorized officials (either from the bidder’s side or from NALCO) shall not be considered.
- v. Neither the bidder nor any of the bidder’s representatives shall have any claim whatsoever against NALCO or any of their respective officials or employees arising out of or relating to this EoI or the procedures thereof.
- vi. **Right to Contents of this EoI:** All EoI offers along with accompanying documentations received shall become the property of NALCO and will not be returned after opening of the offers/ proposals.
- vii. **Acknowledgement of Understanding of EoI Terms & Conditions:** By submitting an offer against this EoI, each bidder shall be deemed to have acknowledged that they have carefully read

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all sections of this EoI documents, including all forms, schedules along with the annexure and they are fully informed about all conditions and limitations contained in the EoI.

- viii. **Evaluation of the Offers:** The offers received against this EoI shall be evaluated in accordance with the conditions specified and against the Bidders Qualifying Criteria spelt out. The Bidders are required to submit all required documentations in support of the ‘Qualifying Criteria’ specified such as detailed project citations and completion certificates, client contact information for verification, profiles of project resources and all other documents, required for evaluation.
- ix. **Language of Offers:** The EoI offer along with all correspondence and documents shall be in English.

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**COVERING LETTER**  
(On Company/ Institute letterhead)

Date:

To,

Mr.Partha Bandopadhyay, AGM (R&D),  
National Aluminium Company Limited,  
Nalco Bhawan, P/1,  
Nayapalli, Bhubaneswar,  
Odisha – 751013, INDIA

**Ref.: Expression of interest for R&D Collaboration including commercialization of technology with NALCO.**

Dear Sir,

Having examined the Expression of Interest (EoI) the undersigned, on behalf of our company intend to participate in R&D Collaboration with NALCO /commercialization of technology and submit the Qualification requirements proposal in response to the Expression of Interest (EoI) for the said project. We attach here with the response, as required by the EoI, which constitutes our proposal. Primary and Secondary contacts for our company are:

	Primary 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. This response includes all information necessary to ensure that the statements therein do not in whole or in part mislead NALCO in its short-listing process. We fully understand and agree to comply that on verification, I/We also understand that incorrect information furnished in this process shall render the bid/ order liable for rejection at any stage of evaluation/ work execution. Our institute agrees for acceptance of all the terms and conditions set out in the EOI documents. 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.....2017

(Signature and Seal of Company)

(In the capacity of)

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**DETAILS OF THE ORGANIZATION/ INSTITUTE**

Name of organization/ Institute:

Nature of business:

Date of Incorporation/ Establishment:

Other Relevant Information:

Total number of Teaching and Research Faculty with PhD qualification:

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**FINANCIAL DETAILS**

	FY 2014-15	FY 2015-16	FY 2016-17
Annual turnover			
Net Profit			
Net Worth			
Debt/Equity ratio			

**Note-** Please submit Audited Annual Reports containing audited balance sheets and profit loss accounts statements for preceding 3 financial years

**EXPERIENCE CRITERIA&PROVEN TRACK RECORD**

List top five R&D and Industrial consultancy or projects ongoing/completed, if any (Last 3 years)

Name of the Project	Sponsoring Agency	Amount sanctioned (Rs Lakhs)	Amount released (Rs Lakhs)	Duration (in years) From- To	Awards (If any)

Patents, if any (Last 5 Years)

a. Filed (No)/ Application number of relevant Patents, if any:

b. Granted (No)/ Patent number of relevant Patents, if any:

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### Brief of Project for Commercialization

#### 1. Name of the Collaborative Project: Development of Heat treatment process for destruction of toxic cyanide and recovery of valuables (sodium, fluorides etc) from spent pot lining materials (SPL).

**Brief of Project:** The used carbon cathodes ('Spent Pot Lining', SPL) from aluminium smelting are typically contaminated with leachable  $\text{CN}^-$  (400-800ppm),  $\text{F}^-$  (3-5%), and  $\text{Na}^+$  (8-11%) which must be removed before disposal to produce material which satisfies environmental guidelines in respect of maximum rates of ion release. As per EPA (Environmental Protection Agency) guide-lines, SPL containing total cyanide >560 ppm, and leachable cyanide >30 ppm considered as a hazardous waste and could not be dumped in land-filling.

The project entitled "Development of heat treatment process for destruction of toxic Cyanide and recovery of valuables (sodium, fluorides, etc.) present in Spent Pot-linings material" chunks of SPL samples crushed, classified, and homogenized.

The heat treatment process is carried out on crushed, classified and homogenised SPL sample at various temperatures in a specially designed laboratory scale rotary kiln furnace. It was found that, destruction of leachable cyanide is possible. The end product was found after heat treatment, to be free of leachable cyanide. Leaching experiments were also carried out to recover fluoride and sodium value.

#### 2. Name of the Collaborative Project: Technical suitability for utilization of Refractory portion of spent pot lining (SPL) in Manufacturing of Ordinary Portland Cement (OPC).

**Brief of Project:** Spent Pot Lining (SPL) contains impurities such as  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ . Investigations on compatibility with low alkali raw materials for cement manufacture showed that Spent Pot Line (SPL) waste can be gainfully utilized as mineraliser by blending in cement raw mix reducing clinkerization temperature, thereby yielding good quality clinker in performance comparable to control Ordinary Portland Cement.

#### 3. Name of the Collaborative Project: Industrial scale investigation for the fabrication of wear resistant ceramic tiles using NALCO coal ash

**Brief of Project:** Raw materials Fly Ash and Pond Ash, required for tile fabrication have been characterized for tile making. Commercially available constituent materials such as China clay, flux, dispersant and other additives were mixed and optimized to produce green tile using binders. The structural, micro-structural, composition, particle size distribution, radio-active characteristics of the stated raw materials as appropriate have been tested.

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Samples were made using the above raw materials to optimize suitable composition, particle size distribution and heat treatment schedule to yield acceptable modulus of rupture and water absorption values. The optimized compositions with appropriate Modulus of Rupture and water absorption characteristics have been used to make 1' x 1' tiles.

Repeated Industrial trial has been done and the technology is established to make glazed wall tiles. The tiles have been tested at Central Glass & Ceramic Research Institute, Ahmedabad and it meets properties of wall and floor tiles.

#### **4. Name of the Collaborative Project: “Development of Light Weight Aggregates – Foam Products”.**

**Brief of Project:** Dry lumps of red mud samples and crushed Fly ash (major raw materials) were homogenized in the laboratory. The process development was carried out on homogenized red mud and fly ash mixture along with addition of sodium hydroxide and aluminium powder mixture along with water as foaming agents.

The foamed wet mass in brick molds was dried and fired at high temperatures in a specially designed laboratory scale muffle furnace and it is established that depending on the raw material composition the bricks when fired at high temperature can give quality light weight foamed bricks (LWFB), which can be used in building and other construction applications. The utility of LWFB for urban housing application such as for making boundary walls, partition walls for high rise multistoried and low rise buildings was verified by standard prism test and it is established that the bricks can give better thermal insulating properties.

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