

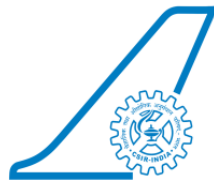


**Expression of Interest (EOI)**

**For**

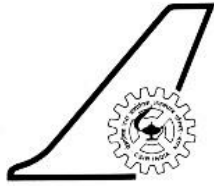
**Licensing of**

**Surface Modification, Coating Technologies, and the  
products Suitable for Aerospace and Other Applications**



**CSIR-NAL**

**National Aerospace Laboratories  
Council of Scientific & Industrial Research  
HAL Airport Road, Kodihalli  
Bangalore-560017**



**Council of Scientific and Industrial Research  
NATIONAL AEROSPACE LABORATORIES**

P.B. No. 1779, HAL Airport Road, Kodihalli, Bengaluru – 560 017  
Phone: +91-80-25086147/6207/6130, Fax: +91-80-25086009

email: [ktmd.head@nal.res.in](mailto:ktmd.head@nal.res.in)

**ISO: 9001:2008 Certified**

**KTMD/BDG/SED-EOI/2021-22/1**

**25<sup>th</sup> January 2022**

**EXPRESSION OF INTEREST**

CSIR- National Aerospace Laboratories (CSIR-NAL), Bengaluru, India, is one of the premier laboratories under the Council of Scientific and Industrial Research, an autonomous body under the Department of Scientific and Industrial Research (Government of India), New Delhi. CSIR-NAL is a Science and Knowledge-based Research, Development, and Consulting Organization. It is internationally known for its excellence in Scientific Research in Aerospace Engineering and other disciplines.

An Expression of Interest (EOI) is initiated at CSIR-NAL for out-licensing of **“Surface Modification, Coating Technologies, and the products Suitable for Aerospace and Allied Applications”** from established aircraft and allied engineering companies/firms/start-ups/MSMEs for the following: -

<b>EOI Document Number</b>	<b>Item Description</b>
<b>KTMD/BDG/SED-EOI/2021-22/1</b>	<ol style="list-style-type: none"><li>1. Eco-friendly anodization process for the corrosion protection of aircraft-grade aluminum alloys</li><li>2. CSIR-NAL MRA 1426/1427 Giant Magneto-Resistance (GMR) – multilayer based magnetic sensor and Product thereof</li><li>3. A process for the preparation of thermal insulation paint</li><li>4. A process for the synthesis of plasma sprayable grade yttria stabilized zirconia (YSZ), cluster-paired YSZ and pyrochlore-based <math>Gd_2Zr_2O_7</math> and <math>La_2Ce_2O_7</math> powders for thermal barrier coatings</li><li>5. Anti-corrosion pigments/additives<ol style="list-style-type: none"><li>a. for aerospace-grade aluminum alloys</li><li>b. for oil pipeline applications made of MILD STEEL (C1018, APIX5)</li></ol></li></ol>

1. The address for submission of document for obtaining further information:

Dr. M. Manjuprasad,  
Head, KTMD,  
CSIR-National Aerospace Laboratories,  
Old Airport Road, Kodihalli,  
Bengaluru-560017.  
Tel-080-25086147/25086130  
email: [manjuprasad@nal.res.in](mailto:manjuprasad@nal.res.in), [rvenkatesh@nal.res.in](mailto:rvenkatesh@nal.res.in)

2. The EOI document for submitting the offers can be downloaded free of cost from the CSIR-NAL website [www.nal.res.in](http://www.nal.res.in). The prospective firms which are willing to obtain licensing of technology shall adhere to due dates in the EOI details
3. The schedule for submission and opening of the offers is as follows

Date & Time of Submission of Offers		Date & Time of Opening of Offers	
Date	Time (IST)	Date	Time (IST)
<b>18<sup>th</sup> February 2022</b>	<b>10.00</b>	<b>18<sup>th</sup> February 2022</b>	<b>11.00</b>

**Note: Any queries/broad clarifications on technology may be sought by e-mail/phone latest by Feb.11, 2022**

4. **Date and Time for receipt of hard copy of proposals:** The proposals in hard copy should reach the tender box on or before the date and time mentioned at Sr. No.3 for submission of proposals. Late/delayed proposals will not be considered. Postal/Courier delays will not be accepted as an excuse. In case the last date and time are declared a holiday at a later date, then the due date and time for receipt of the opening will be shifted to the next working date and time automatically. No corrigendum will be issued in this regard.
5. A brief description of the qualification criteria is provided herewith. The Participants are requested to submit documentary evidence to prove technical capabilities, client list, experience, and credentials as per formats 1-7 enclosed.
6. The Techno-Commercial Committee (TCC) shall scrutinize and finalize the firms meeting the qualification criteria after knowing/obtaining details about relevant/available details and R&D needs of our Laboratory.
7. For evaluating the responses, CSIR-NAL, if required, may call the firms to present their case. The presentation can be considered via WebEx/Skype/Video Conferencing also.
8. The Director, CSIR-National Aerospace Laboratories (NAL), Bengaluru, India, reserves the right to accept or reject any or all EOI notification/tenders/offers or withdraw the Notice at any stage of processing without assigning any reasons whatsoever. Such an event would not cause an obligation of any kind to CSIR-NAL.

Sd/-

Head, KTMD  
For and behalf of CSIR

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## **1. ORGANIZATION BACKGROUND**

National Aerospace Laboratories (NAL), a constituent of the Council of Scientific and Industrial Research (CSIR), India, established in the year 1959, is the only government aerospace R&D laboratory in the country's civilian sector. CSIR-NAL is a high-technology-oriented institution focusing on advanced disciplines in aerospace. CSIR-NAL has several advanced test facilities, and many of them are recognized as National Facilities. CSIR-NAL has provided significant value-added inputs to all the Indian national aerospace programmes. Over the last five decades, its contributions have enabled it to create a niche for itself in advanced aerospace research and technology development. CSIR-NAL has also developed many critical technologies for the strategic sector and continues to support the mission-mode programmes of the country.

CSIR-NAL's mandate is to develop aerospace technologies with strong science content, design and build small, medium-sized civil aircraft, and support all national aerospace programmes.

The Surface Engineering Division (SED) of CSIR-NAL has been pursuing research in surface modification technologies for aerospace, societal, automotive, and engineering applications. "Concept to commercialization" has always been the thrust of the Division. Over the years, the Division has diversified its activities into the niche areas of tribology, energy, nanoscale architecture, sensors, etc. It has also developed several coatings and surface modification technologies suitable for aerospace and allied applications.

## **2. OBJECTIVE OF TECHNOLOGY LICENSING**

The objective of this EOI is to identify suitable industry partner/s and transfer the following one or more technologies within the stipulated terms of licensing. The ultimate goal of this EOI is to take the technologies to market for the benefit of the industry and users. CSIR-NAL is lawfully entitled to enter into any form of non-exclusive license agreements with selected manufacturer/manufacturers, including transferring technology through suitable agreement to any other interested manufacturers.

- i. Eco-friendly anodization process for the corrosion protection of aircraft-grade aluminum alloys.
- ii. CSIR-NAL MRA 1426/1427 Giant magnetoresistance (GMR) – multilayer based magnetic sensor and product thereof.
- iii. A process for the preparation of thermal insulation paint.
- iv. A process for the synthesis of plasma sprayable grade yttria stabilized zirconia (YSZ), cluster-paired YSZ and pyrochlore-based  $Gd_2Zr_2O_7$  and  $La_2Ce_2O_7$  powders for thermal barrier coatings.
- v. Anti-corrosion pigments/additives
  - a. for aerospace-grade aluminum alloys.
  - b. for oil pipeline applications made of MILD STEEL (C1018, APIX5).

### 3. BROAD SCOPE OF TECHNOLOGY LICENSING

Subject to the terms and conditions of a license agreement, CSIR-NAL shall grant **a non-exclusive License** to the **shortlisted firm(s) registered in India**, a one-time license fee, and royalty-bearing right and license to use and practice the Technology and PROCESSES (“Licensed Technology”) to manufacture, sell and commercialize the Product (**as indicated in Schedule-A**) in India and abroad, including without limitation the right to use, copy, modify, distribute, make derivative works of and otherwise exploit the Licensed Technology during the Term of this Agreement (“License”). The agreement is proposed to be executed on a “Non-Exclusive” basis with multiple manufacturers.

Manufacturers/Firms/Industries shall quote above the Minimum threshold Pricing and Royalty fixed by CSIR-NAL for each technology as given in **Schedule-B**.

This LICENCE shall be valid from the EFFECTIVE DATE and subject to covenants and conditions herein contained and shall remain in force for a period of ten (10) years commencing from the date of commercial production with an obligation to pay the License fee for transfer of know-how and handholding for technology absorption and Royalty to LICENSOR, after the commercialization of the Product (the “Term”). After 10 years, the royalty rate shall be reviewed and decided on mutual consent of parties in light of business experience.

## **4. INSTRUCTIONS TO PROPONENTS**

### **4.1 Documents to Furnish**

Proponents are requested to go through all pre-qualification requirements, the scope of licensing for execution & requirements w.r.t technical/ financial capabilities for acceptance and submission of documents for verification by CSIR-NAL.

Documents to be furnished are:

- a. Authorization Letter (Format – 1)
- b. Declaration - Expression of Interest (Format – 2)
- c. Applicant Profile for Technology Transfer (Format-3)
- d. Strength & Merits of the Applicant (Format-4)
- e. Undertaking with regard to Blacklisting (Format-5)
- f. Undertaking with regard to Non-Litigation (Format- 6)
- g. Financial Offer for the License fee and Royalty (Format-7)

Additional requirements

- h. EOI document with each page duly stamped and signed by the Authorized signatory.
- i. Supporting documents, as mentioned in Formats 1-7
- j. Latest MSME Certificate specifying the classification of industry (if applicable)
- k. Any other information which the proponent may like to provide.

CSIR-NAL reserves the right to call for any clarifications confined in the broad scope, wherever such a clarification becomes necessary for proper judgment in evaluation.

### **4.2 Rejection Criteria**

The application is liable to be rejected if:

- a. The proposal is not submitted as per the requirements indicated in the EOI.
- b. Not in the prescribed format.

- c. Not properly stamped and signed as per requirements.
- d. Received after the expiry of the due date and time.
- e. All relevant supporting documents are not furnished with the Pre-Qualification Criteria (PQC).
- f. The proposal shall be substantially responsive without any material deviation, failing which the proposal shall be summarily rejected.
- g. Any discrepancy observed in the submitted documents

#### **4.3 Disclaimer**

- a. CSIR-NAL may, at its discretion or as a result of a query, suggestion, comment of the offerer, may modify the EOI documents by issuing an amendment or a corrigendum at any time before opening the EOI. Any such amendment or corrigendum will be uploaded on CSIR-NAL's website [www.nal.res.in](http://www.nal.res.in) and the same will be binding on the all the proponents, as the case may be.
- b. CSIR-NAL, at its discretion, may extend the due date of submission of EOI, and the decision of CSIR-NAL in this respect would be final and binding on the respondents. In the event of changes in the schedule, CSIR-NAL shall notify the same only through its website [www.nal.res.in](http://www.nal.res.in). Interested respondents are advised to check the above website regularly for corrigendum/addendum, if any, which will be published only ~~in~~ on the website.
- c. If at any time during the examination, evaluation, and comparison of EOI, CSIR-NAL, at its discretion, can ask the bidder for the clarification of its EOI. The request for clarification and the response shall be in writing.
- d. All cost and expenses associated with the preparation and submission of EOI response shall be borne by the proponents. CSIR-NAL shall not be responsible for any late receipt of applications for any reasons whatsoever.
- e. CSIR-NAL engages no agent/agents or third party/parties in this process. It is advised to deal directly with the CSIR-NAL representative who is a signatory to this document.
- f. Conditional offers will be summarily rejected. EOI which is found to be incomplete in content and/or attachments and/or authentication etc. is liable to



be rejected. CSIR-NAL reserves the right to reject all applications without assigning any reasons thereof.

g. CSIR-NAL may relax or waive any of the conditions stipulated in this document as deemed necessary in the best interest of the CSIR-NAL without assigning any reasons thereof.

**h. The draft License Agreement will be issued only to the shortlisted firms who have responded to this EOI.**

## **5. EVALUATION METHODOLOGY**

Screening of EOIs shall be carried out by a Committee constituted by the Director, CSIR-NAL, as per Pre-Qualification criteria mentioned in the EOI document and based on verification of documents submitted. Shortlisted proponents shall be sent the draft License agreement /and sample material for further evaluation.

## **6. PRE-QUALIFICATION CRITERIA (PQC)**

The following will be the minimum PQC. Responses not meeting the minimum PQC will be summarily rejected and will not be evaluated further:

<b>Sl. No.</b>	<b>Pre-Qualification Criteria</b>	<b>Supporting copy of documents required</b> <i>(All documents must be self-attested by the Authorized person of the proponent)</i>
1	The proponent shall be a legal entity, registered as a Company/LLP/Society/ partnership firm/ proprietorship firm under respective acts in India.	Company Incorporation Certificate from ROC/Partnership deed etc.
2	The proponent must be registered in India with taxation and other administrative authorities.	GST Registration or GST exemption certificate/ PAN Card

3	The proponent should have manufactured the relevant products for at least three (3) immediately preceding years (2017-18 to 2019-20).	Pamphlet/brochure of the product
4	The proponent has to be financially sound in three (3) immediately preceding years (2017-18 to 2020-21) having a minimum annual turnover of Rs.5 crores. For start-up industries as per Gol guidelines	Certificate from the Chartered Accountant of the Organization/ Audited Balance sheets for last three financial years or Income Tax return.
5	The proponent should have a registered office and a manufacturing Unit in India	Registration copies of both
6	Capacity & skillset to produce, market, and after-sales support	Applicant profile for Technology Transfer ( Format -3)
7	Strength & Merits of the Applicant	As per Format -4
8	The proponent should not be involved in any blacklisting and litigation that may have an impact of affecting or compromising the conditions required under this EOI and in the agreement.	Undertaking on Proponent's Letter  Head, duly signed and stamped by the Authorized Signatory (As per format – 5 & 6)
9	License Fee and royalty for the use of technology	The proponent shall maintain the dignity of Minimum Threshold Pricing given for the authorized use of technology and shall quote considering these benchmark values. (As per format – 7)
10	Any accredited & ISO certifications	Respective certifications copies to be submitted

In case of any clarification required, please contact:

1. Dr. M. Manjuprasad  
Head, KTMD  
CSIR-National Aerospace Laboratories  
HAL Airport Road, Kodihalli  
Bengaluru-560017  
Tel-080-25086147/25086130  
Email: manjuprasad@nal.res.in
2. Mr. R Venkatesh  
Head, BDG  
CSIR-National Aerospace Laboratories

HAL Airport Road, Kodihalli  
Bengaluru-560017  
Tel-080-25086130  
Email: rvenkatesh@nal.res.in

3. Dr Harish Bashilia  
Head, SED  
CSIR-National Aerospace Laboratories  
HAL Airport Road, Kodihalli  
Bengaluru-560017  
Tel-080-25086248  
Email: harish@nal.res.in

**Authorization Letter**

(To be submitted on Agency's Letter Head)

Director,  
CSIR-NAL, HAL Airport Road,  
Kodihalli, Bangalore- 560017.

Subject: Letter for Authorized Signatory

Ref. No. Ref: EOI No. ....dated ..... 2021

Sir,

This has reference to your above mentioned Expression of Interest (EOI)  
for .....

Mr./Miss/Mrs/Dr \_\_\_\_\_

is hereby authorized to submit the EOI documents and participate in the processing  
on behalf of M/s\_\_\_\_\_(Agency Name).

The specimen signature is attested below:

Name: \_\_\_\_\_

(Specimen Signature of Representative)

\_\_\_\_\_

Yours faithfully,

(Signature of the Authorized  
signatory)

Name:

Designation:

Seal :

Date:

Place:

**Expression of Interest**

*(To be submitted on Agency's Letter Head)*

To

Director,

CSIR-NAL, HAL Airport Road,

Kodihalli, Bangalore- 560017.

Subject: Submission of Expression of Interest (EOI) for Transfer of technology on.....

Ref: EOI No. ....dated .....

Sir,

The undersigned have read and examined in detail all the EOI documents pertaining to your transfer of technology do hereby express the interest to undertake the manufacture of the product as mentioned in the EOI document.

The details of the Company and contact person are given below:

1	Name of the Proponent	
2	Address	
3	Name, designation & address of the person to whom all references shall be made	
4	Telephone No. (with STD code)	
5	Mobile No. of the contact person	
6	Email ID of the contact person	

The following documents are to be enclosed:

Sl. No.	Documents required	Type of document attached	Page No.
1	Company Incorporation Certificate from ROC/start up/Partnership deed		
2	GST Registration or GST exemption certificate/ PAN Card.		
3	Pamphlet or Brochure		
4	Certificate from the Chartered Accountant of the Organization/Audited Balance sheets for last three financial years, Income Tax return.		
6	Proof of a registered office and a manufacturing Unit in India.		
7	Authorization Letter	As per format – 1	
8	Expression of Interest	As per format – 2	
9.	Applicant Profile for Technology Transfer	As per format – 3	
10.	Strength & Merits of the Applicant	As per format - 4	
9	Undertaking on the Letter Head regard to black listing	As per format – 5	

10	Undertaking with regard to Non-Litigation	As per format – 6	
11	Financial Offer for License Fee and Royalty Offer	As per format – 7	
12	MSME Certificate (if applicable)		
13	Any accredited & ISO certifications ( If applicable)		

I/we hereby declare that my/our EOI is made in good faith, and the information contained is true and correct to the best of my/our knowledge and belief.

Thanking you,

Yours faithfully,

(Signature of the Authorized signatory)

Name:

Designation:

Seal:

Place:

**Applicant Profile for Technology Transfer***(To be submitted on Agency's Letter Head)*

1. Organizations or entrepreneurs interested in seeking technology from the laboratory may kindly provide background information on their organization/experience. This information will help CSIR-NAL to identify a suitable industry partner for technology transfer.
2. Kindly attach copies of the **annual report, product brochures/ pamphlets**, and any other relevant information along with this form. Add additional sheets if needed.

Sl. No	Organization Background & Experience/Expertise/Facilities
1.	<b>Please state the nature and details of business carried out at present</b> (please add separately, if needed)
2.	<b>Major products/brands with market share</b>
3.	<b>Company's marketing setup and plans for marketing the products</b> (domestic & exports)



4.	<b>Company's manufacturing setup/strength with a brief description of facilities/equipment/processes handled</b>
5.	<b>Company's human resources and highlight qualification/experience of key technical and managerial</b>
6.	<b>Company's R&amp;D setup/strength/technology tie-up with other organizations</b>
7.	<b>Company's experience in commercializing technology/technology absorption</b>
8.	<b>Company's experience in related technologies offered for licensing</b>

9.	<b>Company's setup on technical assistance &amp; after-sales support to clients</b>
10.	<b>Please highlight any other relevant information such as synergy in technology or marketing of the product on offer</b>

I/we hereby declare that information given above is true and correct to the best of my/our knowledge and belief.

Thanking you,

Yours faithfully,

(Signature of the Authorized signatory)

Name:

Designation:

Seal:

Date:

Place:

**Strengths & Merits of the Applicant**

*(To be submitted on Agency's Letter Head)*

The applicant may submit the following details to highlight the strength and merits of the applicant. Attach additional sheet, if required.

**1. Name of technology/product (s) of interest with reasons for selecting:**

(i)

(ii)

(iii)

**2. Do you have the necessary/related manufacturing facility that may be required for the technology/product selected? Yes / No**

**3. If No, what is your strategy for manufacturing setup?**

**4. Do you have any experience in manufacturing and/or marketing of products of this kind? Yes /No**

**5. If Yes, kindly share the details**

**6. If No, kindly share your plan of action to accomplish this technology's technology commercialization.**

**7. What is your plan for scaling up?**

**8. How will the field trials be undertaken?**

**9. What support do you anticipate from CSIR-NAL?**

**10. If you are a start-up or a new entry to the field, how do you justify yourselves to be selected as a successful applicant?**

I/we hereby declare that information given above is true and correct to the best of my/our knowledge and belief.

Thanking you,

Yours faithfully,

(Signature of the Authorized signatory)

Name:

Designation:

Seal:

Date:

Place:

**Undertaking with regard to blacklisting**

*(To be submitted on Agency's Letter Head)*

To,

Director,  
CSIR-NAL, HAL Airport Road,  
Kodihalli, Bangalore- 560017.

Subject: Undertaking regarding Blacklisting / Non-Debarment

Ref. No. Ref: EOI No. ....dated..... 2021

Sir,

It is hereby confirmed and declared that  
M/s

---

is

Not blacklisted/debarred by any Government Department/Public Sector Undertaking/Private Sector/or any other agency for which works/assignments/services have been executed/undertaken.

Yours faithfully,

(Signature of the Authorised signatory)

Name:

Designation:

Seal:

Date:

Place:

Note: Any discrepancy found in the undertaking shall be liable for cancellation of License and Forfeiting of paid license fee.

**Undertaking with regard to Non-Litigation**

*(To be submitted on Agency's Letter Head)*

To,  
Director,  
CSIR-NAL, HAL Airport Road,  
Kodihalli, Bangalore- 560017.

Subject: Undertaking regarding Litigation

Ref. No. Ref: EOI No. ....dated.....2021

Sir,

It is hereby confirmed and declared that M/s -----,  
does not have any litigation/arbitration history with any Government department/  
Public Sector Undertaking/ / or any other public authority with which any MoU  
was/has been executed/undertaken.

Yours faithfully,

(Signature of the Authorized signatory)

Name:

Designation:

Seal:

Date:

Place

Note: Any discrepancy found in the undertaking shall be liable for cancellation of License and Forfeiting of paid license fee.

**Financial Offer to License Fee and Royalty**

*(To be submitted on Agency's Letter Head)*

To,

Director,

CSIR-NAL, HAL Airport Road,

Kodihalli, Bangalore- 560017.

Subject: Undertaking for License Fee and Royalty

Ref. No. Ref: EOI No. ....dated.....2021

Sir,

It is hereby confirmed that M/s -----, agrees to pay a License fee .....and Royalty of --- % (in words----) on Net Sales to the CSIR-NAL, as per the terms for the Transfer of Technology for .....

Yours faithfully,

(Signature of the Authorized signatory)

Name:

Designation:

Seal:

Date:

Place:

**Note: (i) For one or more technologies, provide a separate financial offer**

**(ii) Refer Schedule B for Minimum threshold Pricing of License Fee & Royalty**

## **SCHEDULE – A**

### **(Technology Profile enclosed for following technologies)**

- I. Eco-friendly anodization process for the corrosion protection of aircraft-grade aluminum alloys
- II. CSIR-NAL MRA 1426/1427 Giant magnetoresistance(GMR) – multilayer based magnetic sensor and product thereof.
- III. A process for the preparation of thermal insulation paint
- IV. A process for the synthesis of plasma sprayable grade yttria stabilized zirconia (YSZ), cluster-paired YSZ and pyrochlore-based  $Gd_2Zr_2O_7$  and  $La_2Ce_2O_7$  powders for thermal barrier coatings
- V. Anti-corrosion pigments/additives
  - a. for aerospace-grade aluminum alloys.
  - b. for oil pipeline applications made of MILD STEEL (C1018, APIX5)

**.....Details on next page**



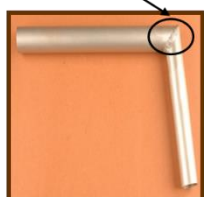
## TECH PROFILE OF TECHNOLOGIES ON OFFER

1.	Title of Technology (Product/Process/Design/Equipment)	Eco-friendly anodization process for the corrosion protection of aircraft-grade aluminum alloys
2.	Brief Description	Chromic acid anodization (CAA) has been the preferred surface treatment process to impart superior corrosion resistance performance to Aluminium (Al) alloys in the aircraft industry. However, hexavalent chromium (Cr <sup>6+</sup> ) present in CAA process is carcinogenic in nature and the process proposed to be phased out in year 2026. Towards this, CSIR-NAL has developed a patented process comprising of tartaric sulphuric acid (TSA) anodization followed by permanganate sealing with a performance level equivalent to that of CAA developed coatings. Developed process complies with RoHS and REACH environmental regulations and it is eco-friendly. To scale up the process, pilot plant of 400 ltrs capacity has been established and various components having complex geometry such as welded tube, casting, pulley bracket rudder, etc., have been anodized and the process clearance has been obtained from RCMA, CEMILAC.
3.	Year of Development	2017
4.	Application/Uses in various sectors	Aerospace and Engineering applications
5.	Unique Technical Features	<ul style="list-style-type: none"> <li>➤ Eco-friendly, Chromate and fluoride-free process (<b>RoHS &amp; REACH</b> compliant), suitable for aircraft Al alloys</li> <li>➤ Simple, cost effective and easy to scale up</li> <li>➤ Good adhesion with the primer layer</li> <li>➤ Qualified &gt; 2000 h of continuous salt fog test and &gt; 12 months in coastal environment</li> <li>➤ Excellent self-healing ability having Tensile and fatigue properties at par with CAA</li> <li>➤ Qualified as per MIL-A-8625F standard</li> <li>➤ Cost comparable to existing CAA process</li> </ul>
6.	Development a. Lab Level b. Prototype application/testing/certification c. Further modification/development (if required to place in market)	<p>TRL: 6-7</p> <p>Anodizing pilot plant (400 L) facility established.</p> <p>Various components have been anodized</p> <p>Clearance accorded by RCMA (F&amp;F-FOL), CEMILAC &amp; Quality assurance coverage provided by ORDAQA (ARDC)</p>

7.	IPR protection (Patent/Design/Trademark/Copyright)	Patent granted in India (IN360625, dt. March 09, 2021), USA (US 10920332 B2, dated Feb.16, 2021) & Australia (AU 2016210539, dated Jan. 21, 2021)  Patent Pending in Europe (Application No EP16706439A & Publication No. EP3247823A1)
8.	Major Plant Equipment and Machinery Required	Rectifier; Chemical resistant tanks; Filtration and circulation systems; Heating and cooling systems and exhaust systems
9.	Market size / volume	<ul style="list-style-type: none"> <li>At present no chromate-free technology is available for the corrosion protection of AA 2024 alloys used in aircraft applications</li> <li>An indigenous and cost-effective process has been developed to be used in all aircraft alloys for corrosion protection both civil and military aircraft.</li> <li>The global metal anodizing market is estimated to surpass US\$ 1,094.6 million in terms of revenue by the end of 2027, exhibiting a CAGR of 5.2% during the forecast period (2021 to 2027)</li> </ul>
10.	Major Raw Materials to be Utilized	Aircraft grade aluminum alloys Organic and inorganic chemicals
11.	Commercialization and Type of License (exclusive or non-exclusive)	Non-exclusive licensing
12.	Existing Product/Process (Available in Market)	Not available
13.	Techno-Economics (Benefits) in comparison to existing product/process.	At par with existing process with regard to techno-economics

### Latest Photographs of the Product/Technology

Welded Joint



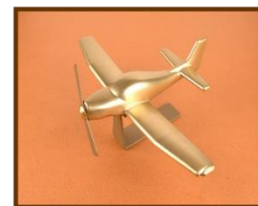
**Welded Tube**



**Casting**



**Pulley Bracket  
Rudder**



**Aircraft model**

## Eco-friendly anodized aluminum alloy components

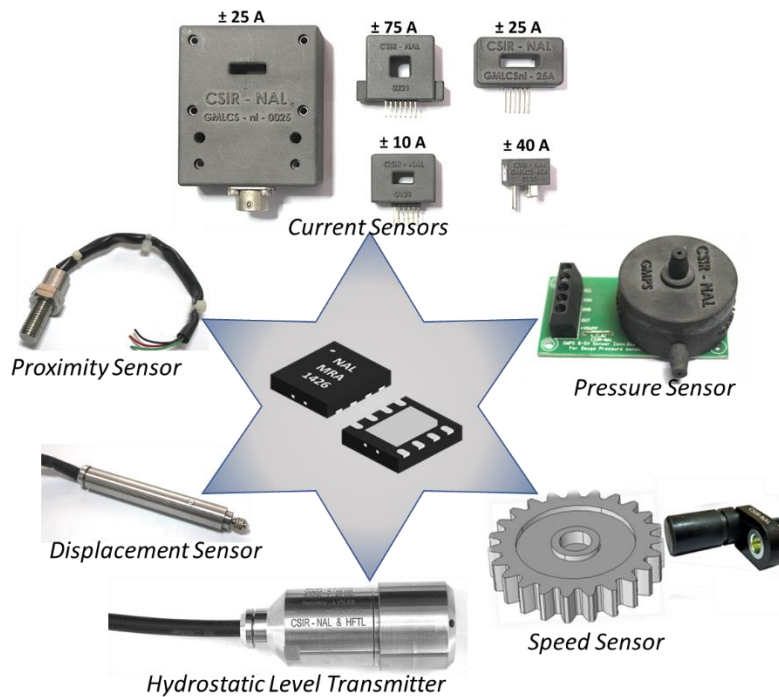
### TECH PROFILE

1.	Title of Technology (Product/Process/Design/Equipment)	NAL MRA 1426/1427 Giant magnetoresistance (GMR) –multilayer based magnetic sensor and product thereof.
2.	Brief Description	The MRA 1427/1426 magnetic sensor utilizes Giant magnetoresistance (GMR) technology, where highly sensitive unshielded GMR elements are configured in the form of single Wheatstone bridge. The Wheatstone bridge generates a differential output voltage with respect to magnetic field gradient along the sensor's sensitive direction. Each resistor has 4-5 kΩ nominal resistance and output of the bridge is purely ratiometric with the power supply voltage. Due to our unique technology and design, MRA 1427 is highly sensitive and has the ability to detect signals at the wide air gap. The excellent thermal and voltage stability makes it suitable for challenging environments. The MRA 1427 GMR sensor is available in 8T-DFN package with dimensions 3 mm x 3 mm x 0.75 mm.
3.	Year of Development	2017
4.	Application/Uses in various sectors	<p><b>Automobile sectors:</b></p> <ol style="list-style-type: none"> <li>1. Gear tooth sensing</li> <li>2. Direction and motion sensing</li> <li>3. DC/AC Current sensing</li> </ol> <p><b>Industrial sectors</b></p> <ol style="list-style-type: none"> <li>1. Linear and rotary speed sensing</li> <li>2. DC/AC current sensing</li> <li>3. Water level and pressure sensing</li> </ol>
5.	Unique Technical Features	<p>Chip type: 8T DFN package</p> <p>Sensing element configuration : Wheatstone bridge configuration            Bridge resistance : <math>6.4 \pm 5\%</math> kΩ            Input voltage : 1-30 V, Field Range : 5-100 G, unipolar            Saturation of GMR Sensor Elements : <math>\pm 300</math> G, Single Resistor Sensitivity : 0.033%/G, Temperature Coefficient of Resistance : <math>0.033 \Omega/^{\circ}\text{C}</math>, Temperature dependence of GMR : <math>-0.03\%/^{\circ}\text{C}</math>, Operating Temperature Range : -70 to 130 °C</p>

6.	<p>Development</p> <p>a. Lab Level</p> <p>b. Prototype application/testing/certification</p> <p>c. Further modification/development (if required to place in market)</p>	<p>TRL- 08</p> <p>Completed</p> <ol style="list-style-type: none"> <li>1. Magnetic field sensing chip: Sold 1 lakh sensor to a company.</li> <li>2. Speed sensor, Tested in Two wheeler in collaboration with TVS Motor Ltd, Tamilnadu, ARAI certification</li> <li>3. Current sensor: Industry level testing and collaboration agreement with a Company.</li> <li>4. Pressure/level sensor: Field test completed and know transfer to a Company.</li> </ol> <p>Modification or development as per user requirement.</p>
7.	IPR protection (Patent/Design/Trademark/Copyright)	<ol style="list-style-type: none"> <li>1. An Improved Speedometer (IN 289653)</li> <li>2. An improved magnetic multilayer structure for sensor applications (1221/DEL/2015)</li> <li>3. Magnetic Pressure Sensor (3689/DEL/2015)</li> <li>4. An improved magnetoresistive angle sensor (201811014987)</li> <li>5. A Magnetoresistance Based Current Sensor and Sensing Method Thereof (202011005844)</li> </ol>
8.	Major Plant Equipment and Machinery Required	<ol style="list-style-type: none"> <li>1. Clean room environment (Class 1000-10000)</li> <li>2. UHV compatible sputtering system (deposition up to 6-inch wafer)</li> <li>3. Ion milling system</li> <li>4. Mask aligner, spin coater, spin developer, rinse and drying system</li> </ol>
9.	Market size / volume	<p>According to CAGR report, GMR sensor consumption is expected to be 223.3 million units by 2026. Current global GMR sensor market is valued about 240 million US\$.</p> <p>Source: <a href="http://www.qyresearch.com">www.qyresearch.com</a></p>
10.	Major Raw Materials to be Utilized	<p>CoFe, Cu, Ta, Al sputtering targets</p> <p>Si wafers, Photoresist materials, Ar and O2</p>

		gases.
11.	Commercialization and Type of License (exclusive or non-exclusive)	Non-exclusive licensing
12.	Existing Product/Process (Available in Market)	Available in the market from Infineon Technologies, Allegro Microsystems, Hitachi Metals, NVE, NAL, Yamaha, Robert Bosch, Alps Alpine, Sensitec,
13.	Techno-Economics (Benefits) in comparison to existing product/process.	1/10 <sup>th</sup> of cost of existing market price

### Latest Photographs of the Product/Technology

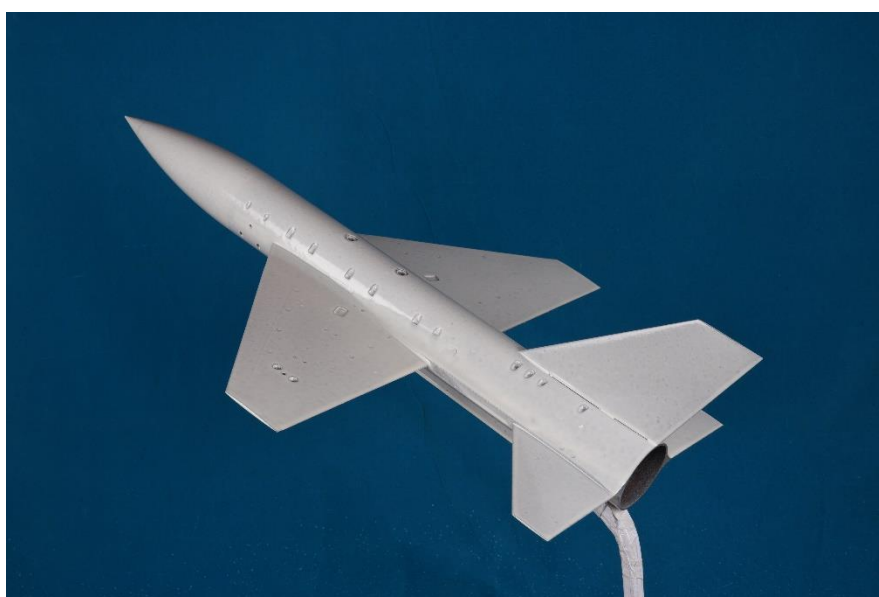


## TECH PROFILE

1.	Title of Technology (Product/Process/Design/Equipment)	A process for the preparation of thermal insulation paint
2.	Brief Description	<p>The surface temperature of an object or structure can rise due to many reasons. It may be the accumulated heat when it absorbs solar energy or heat from an external source impinging on the surface. This excessive temperature may result in various undesired consequences and may be detrimental to the structures. Hence, it is required that they are protected from heat. Cost-effective and efficient thermal insulation paint serves the purpose and leads to energy saving and emission reduction.</p> <p>The product is an epoxy based sprayable paint suitable for metallic and non-metallic surfaces. It provides thermal insulation and can shield the surface from heat by causing a temperature drop of about 22-25 °C when hot gas of ~135°C is impinged on the coated surface. The paint although is designed for aerospace application, it is suitable for automobile and other industries. The paint has qualified the industry standard tests for thermal stability, weathering resistance and impact test.</p>
3.	Year of Development	2021
4.	Application/Uses in various sectors	Heat insulation applications in aerospace, domestic, automotive, marines, industrial, etc., sectors
5.	Unique Technical Features	<ul style="list-style-type: none"> <li>• Sprayable room temperature composition</li> <li>• Temperature drop: 22-25 °C when hot gases with ~135°C is impinged on the surface for thickness ~ 1000 µm</li> <li>• Qualified accelerated Weathering Test as per ASTM G154</li> <li>• Feasible on metallic and non-metallic surfaces</li> <li>• Compatible with other existing epoxy or PU based paint layers</li> <li>• Coating stability: 200°C</li> </ul>
6.	Development d. Lab Level	TRL- 6

	e. Prototype application/testing/certification f. Further modification/development (if required to place in market)	The product is currently taken up for certification from CEMILAC for aerospace application
7.	IPR protection (Patent/Design/Trademark/Copyright)	In the process of filing
8.	Major Plant Equipment and Machinery Required	Nil
9.	Market size / volume	The thermal insulation coatings market was predicted to be USD 8.5 billion in 2020 and is projected to reach USD 11.3 billion by 2025, at a compounded annual growth rate (CAGR) of 5.8% between 2020 and 2025
10.	Major Raw Materials to be Utilized	Epoxy resin & readily available insulating fillers
11.	Commercialization and Type of License (exclusive or non-exclusive)	Non-exclusive licensing
12.	Existing Product/Process (Available in Market)	Few commercial products are available for building and aerospace applications
13.	Techno-Economics (Benefits) in comparison to existing product/process.	The developed paint is ~ 50 % cheaper than the commercial paint

### Latest Photographs of the Product/Technology



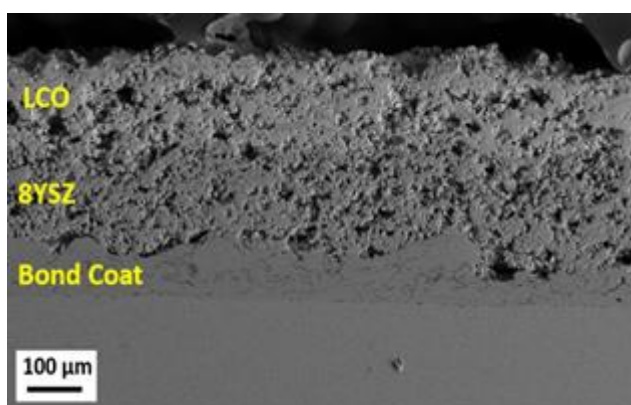
## TECH PROFILE

14.	Title of Technology (Product/Process/Design/Equipment)	A process for the synthesis of plasma sprayable grade yttria stabilized zirconia (YSZ), cluster-paired YSZ and pyrochlore-based $Gd_2Zr_2O_7$ and $La_2Ce_2O_7$ powders for thermal barrier coatings
15.	Brief Description	Thermal barrier coatings (TBCs) are usually fabricated by plasma spray technique. The plasma spray process requires powders with good flowability and large particle size (20-200 $\mu m$ ) as individual smaller particles cannot be sprayed because of their low mass and the resultant inability to be carried in a moving gas stream. Most of the methods reported in the literature for the synthesis of powders involve multi-steps and thus are more expensive and the processes are laborious. Currently, all the thermal spray industries in the country are dependent on imported YSZ, $Gd_2Zr_2O_7$ and $La_2Ce_2O_7$ powders for TBC applications. CSIR-NAL's technology is simple, single-step process, cost-effective, easy to scale-up and does not involve much investment. The in-house developed plasma sprayed coatings have almost matched the properties of the benchmark coatings.
16.	Year of Development	2018
17.	Application/Uses in various sectors	There is a large demand for TBC ceramic topcoat powders from aerospace, energy, defence and transportation sectors
18.	Unique Technical Features	<ul style="list-style-type: none"> <li>• Scalable simple process</li> <li>• Powders suitable for fabricating plasma sprayed single and bilayer TBCs</li> <li>• Powder Flowability: 35-40 seconds per 50gm</li> <li>• Average particle size: 50-90 <math>\mu m</math></li> <li>• Thermal conductivity of coatings at 900°C &lt; 1 <math>Wm^{-1}K^{-1}</math>; Coating porosity: 15-17%</li> <li>• Thermal cycles similar to benchmark coating</li> <li>• Hot corrosion resistance better than benchmark coating</li> </ul>



19.	Development g. Lab Level h. Prototype application/testing/certification i. Further modification/development (if required to place in market)	<b>TRL-4</b> At lab level, 1 Kg/batch has been prepared and the powders have been sprayed on a gas turbine blade length of 12 cm.
20.	IPR protection (Patent/Design/Trademark/Copyright)	IN201811047390 filed 14/12/2018
21.	Major Plant Equipment and Machinery Required	<ul style="list-style-type: none"> <li>• Furnace required for calcination</li> <li>• Centrifuge for separation of precipitate</li> </ul>
22.	Market size / volume	Global Thermal Barrier Coatings Market is expected to rise from its initial estimated value of USD 14.91 billion in 2018 to an estimated value of USD 25.48 billion by 2026, registering a CAGR of 6.93% in the forecast period of 2019-2026
23.	Major Raw Materials to be Utilized	Cheaper readily available chlorides, nitrates, oxides and bases
24.	Commercialization and Type of Licence (exclusive or non-exclusive)	Non-exclusive licensing
25.	Existing Product/Process (Available in Market)	Indigenous products not available in the country
26.	Techno-Economics (Benefits) in comparison to existing product/process.	Half the cost of imported powders

### Latest Photographs of the Product/Technology



**Microstructure of the cross-section of bilayer TBC fabricated with indigenous 8YSZ and  $\text{La}_2\text{Ce}_2\text{O}_7$  (LCO) powders**



**Plasma sprayed YSZ coating on a gas-turbine blade**

## TECH PROFILE

1.	Title of Technology (Product/Process/Design/Equipment)	Anti-corrosion pigments/additives for aerospace grade aluminum alloys.
2.	Brief Description	<p>Sustainable corrosion pigments have been developed and synthesized by CSIR-NAL for long term corrosion protection of aerospace grade aluminum alloys. These corrosion pigments inhibitors serve as replacement /alternative to the carcinogenic Strontium Chromate pigment presently used in the primer layer of the aircraft paint system.</p> <p>CSIR-NAL's corrosion pigments inhibitors have Qualified more than 6000h of salt spray as per ASTM B117 and also certified and tested at HAL, Bengaluru.</p>
3.	Year of Development	2020
4.	Application/Uses in various sectors	Defense and strategic sector
5.	Unique Technical Features	<ul style="list-style-type: none"> <li>• Indigenously developed by using simple one pot synthesis method</li> <li>• Concentration is as low as 2wt%</li> <li>• Self-healing Chrome free paint system, compatible in paints and primers having Corrosion inhibition &gt;90% and 80% yield</li> <li>• Qualified for &gt;2000h in ASTM B-117 at HAL</li> <li>• Also used as a sealing agent during anodization</li> </ul>
6.	Development j. Lab Level k. Prototype application/testing/certification l. Further modification/development (if required to place in market)	TRL- 6
7.	IPR protection (Patent/Design/Trademark/Copyright)	NIL
8.	Major Plant Equipment and Machinery Required	Rotary Flash evaporator, magnetic stirrer, condenser, precision weighing balance

9.	Market size / volume	The global anti-corrosion coating market is estimated to be USD 24.84 Billion in 2017 and is projected to reach USD 31.73 Billion by 2022, at a CAGR of 5.0% from 2017 to 2022. This growth can be attributed to the high demand for anti-corrosion coatings from coal-fired power plants as well as solar and wind energy power plants.  Source: <a href="https://www.alliedmarketresearch.com/anti-corrosion-coating-market">https://www.alliedmarketresearch.com/anti-corrosion-coating-market</a>
10.	Major Raw Materials to be Utilized	Chemicals and solvents
11.	Commercialization and Type of License (exclusive or non-exclusive)	Non-exclusive licensing
12.	Existing Product/Process (Available in Market)	No/Modified Process
13.	Techno-Economics (Benefits) in comparison to existing product/process.	The product is indigenous, cheaper and more effective than the existing products.

### Latest Photographs of the Product/Technology

After > 2000h of salt spray – ASTM B117



## TECH PROFILE

1.	Title of Technology (Product/Process/Design/Equipment)	Anti-corrosion pigments/additives suitable for oil pipeline applications made of MILD STEEL (C1018, APIX5)
2.	Brief Description	<p>Sustainable corrosion pigments have been developed and synthesized by CSIR-NAL for long term corrosion protection of oil pipeline made of mild steel. The pigments have following attributed qualities:</p> <ul style="list-style-type: none"> <li>❖ Soluble in water/acid/organic solvents having compatibility in paints/primers/acid tanks.</li> <li>❖ Process provides yield of 80%, ensuring Corrosion protection ~ 89%</li> <li>❖ Qualified ASTM G-170</li> <li>❖ Also acts as Chloride inhibitor and possess Biocidal properties.</li> <li>❖ Soluble in water/acid/organic solvents</li> </ul>
3.	Year of Development	2020
4.	Application/Uses in various sectors	Engineering sector
5.	Unique Technical Features	<ul style="list-style-type: none"> <li>❖ Capable of Corrosion protection in pH environments 4-8</li> <li>❖ Sustainable CO<sub>2</sub> atmosphere for minimum 21 days at 2 wt%</li> <li>❖ Tested in ocean water (D1141) and Qualifies G 170</li> <li>❖ Suitable as batch inhibitor in oil pipelines and also applicable for concrete structures as additive in admixtures or rebar primer</li> </ul>
6.	Development m. Lab Level n. Prototype application/testing/certification o. Further modification/development (if required to place in market)	TRL- 6
7.	IPR protection (Patent/Design/Trademark/Copyright)	NIL
8.	Major Plant Equipment and Machinery Required	Rotary Flash evaporator, magnetic stirrer, condenser, precision weighing balance

9.	Market size / volume	The global anti-corrosion coating market is estimated to be USD 24.84 Billion in 2017 and is projected to reach USD 31.73 Billion by 2022, at a CAGR of 5.0% from 2017 to 2022. This growth can be attributed to the high demand for anti-corrosion coatings from coal-fired power plants as well as solar and wind energy power plants. Source: <a href="https://www.alliedmarketresearch.com/anti-corrosion-coating-market">https://www.alliedmarketresearch.com/anti-corrosion-coating-market</a>
10.	Major Raw Materials to be Utilized	Chemicals and solvents
11.	Commercialization and Type of License (exclusive or non-exclusive)	Non-exclusive licensing
12.	Existing Product/Process (Available in Market)	No/Modified Process
13.	Techno-Economics (Benefits) in comparison to existing product/process.	The product is indigenous, cheaper and more effective than the existing products.

### Latest Photographs of the Product/Technology



C1018 IN ACID SOLUTION DOPED WITH NAL INHIBITOR - > 6 MONTHS

## SCHEDULE – B

### Minimum threshold Pricing of License Fee & Royalty Fixed by CSIR-NAL

Sr.No	Title of Technology	Threshold License Fee and Payment Schedule	Threshold Royalty	Other Terms of Licensing
1	Eco-friendly anodization process for the corrosion protection of aircraft-grade aluminum alloys	<p><b>LF for Large &amp; Medium Industries:</b> <b>Rs. 170 Lakhs + GST</b></p> <p><b>LF for Micro &amp; Small Industries*</b> <b>: Rs. 40 Lakhs + GST</b></p>	Royalty @ 5 % of ex-factory/BOM price/ annual sale paid two times in a year.	<p>i. <b>Non-Exclusive Licensing</b></p> <p>ii. <b>Background IP rights rest with CSIR-NAL</b></p> <p>iii. <b>Licensee shall have the rights for independently made improvements</b></p> <p><b>Payment Schedule of License Fee :</b></p> <p>i. <b>20 % on Signing of agreement</b></p> <p>ii. <b>30% on transfer of Know-how documents</b></p> <p>ii. <b>25% on completion of training at Industry Premises</b></p> <p>v. <b>25% on demonstration of first batch of product/Process at Industry premises</b></p>

2	CSIR-NAL MRA 1426/1427 Giant Magneto-Resistance (GMR) – multilayer based magnetic sensor and product thereof.	LF for Large & Medium Industries: Rs 260 Lakhs+GST  LF for Micro & Small Industries* : Rs. 60 Lakhs+GST	Royalty @. 5 % of ex- factory/BOM price/ annual sale paid two times in a year.	As above
3	A process for the preparation of thermal insulation paint	LF for Large & Medium Industries : Rs. 55 Lakhs + GST  LF for Micro & Small Industries* : Rs.15lakhs +GST	Royalty @ 5 % of ex- factory/BOM price/ annual sale paid two times in a year.	As above
4	A process for the synthesis of plasma sprayable grade yttria stabilized zirconia (YSZ), cluster-paired YSZ and pyrochlore-based $Gd_2Zr_2O_7$ and $La_2Ce_2O_7$ powders for thermal barrier coatings	LF for Large & Medium Industries: Rs 145 Lakhs+GST  LF for Micro & Small Industries* : Rs.30 Lakhs +GST	Royalty @. 5 % of ex- factory/BOM price/ annual sale paid two times in a year.	As above
5	Anti-corrosion pigments/additives for (a) aerospace-grade aluminum alloys (b)Oil pipeline applications made of MILD STEEL (C1018, APIX5)	LF for Large & Medium Industries: Rs.170 Lakhs+ GST  LF for Micro & Small Industries* : Rs. 36 Lakhs + GST	Royalty @ 5 % of ex- factory/BOM price/ annual sale paid two times in a year.	As above

**Note:**

1. The applicant shall quote above the Minimum threshold Pricing in their offer in Format 7
2. All royalty Payments shall carry GST extra as applicable.
3. The license fee for micro and small industries shall be as per Government of India orders (Gazette Notification S.O. 2119 (E) dated June 26, 2020)
  - a. a micro enterprise, where the investment in plant and machinery or equipment does not exceed one crore rupees and turnover does not exceed five crore rupees;
  - b. a small enterprise, where the investment in plant and machinery or equipment does not exceed ten crore rupees and turnover does not exceed fifty crore rupees;
  - c. The latest Udyami Certificate for the above shall be enclosed.
4. License Fee and Royalty are applicable for Companies registered in India.