



संवाद
Sanwaad

Online Workshop

for **Development of Local Suppliers**
for sourcing of engineering items & raw materials

15th January 2021, 10.00 AM

#AatmaNirbharBharat



#VocalforLocal

Seventh Workshop – **Insulation Items**

Hosted by Heavy Electricals Plant (HEP), BHEL , Bhopal

Product Groups for Insulation Items



Electric Machines	Traction Machines	Transformer	Transformer (Jhs)
<ul style="list-style-type: none"> • Resin & Hardener • Polyester Fibre fleece tape • Semiconducting varnish 	<ul style="list-style-type: none"> • Silicon Impregnating Resin • Polyimide film • Polyamide paper • Silicon rubber elastomer 	<ul style="list-style-type: none"> • Pressboard • Beechwood Ring • Cellulosic paper • BOPP Film 	<ul style="list-style-type: none"> • Flexible high temp laminate • Fibre glass tape • Pigment for epoxy resin • Double adhesive paper tape

HEP Bhopal

Transformer Capacitor & Bushing



Transformer

- Pressboard
- Beechwood Ring
- Cellulosic paper
- BOPP Film

Sh S K Mahajan
AGM TRE
HEP Bhopal

Components – Insulating Materials

Classification	Application	Requirement p.a. (Rs Cr)	HSN Code	Whether required by other clients
PRECOMPRESSED PRESSBOARD SHEETS (VARIOUS SIZES FROM 1 MM TO 50 MM THICKNESS) IEC 60641-3-1 and IEC 60763	TRANSFORMERS	Rs Cr 15 Approx 1200 MT	85049010	All Transformer manufacturers ABB, Siemens, GE, T&R, TBEA, BTW, Toshiba

Components – Insulating Materials

Classification	Application	Requirement p.a. (Rs Cr)	HSN Code	Whether required by other clients
BEECHWOOD TOP RING (WITH OUTSIDE DIAMETER FROM 1800 TO 2860 MM AND THICKNESS 50 TO 150 MM) As per IEC:61061	TRANSFORMERS	Rs Cr 3 Approx 130 Nos	85049010	All Transformer manufacturers ABB, Siemens, GE, T&R, TBEA, BTW, Toshiba

Components – Insulating Materials

Classification	Application	Requirement p.a. (Rs Cr)	HSN Code	Whether required by other clients
CELLULOSIC PAPER (KRAFT INSULATING PAPER) IEC: 60554-3-1 (IS:9335)	BUSHINGS, CURRENT TRANSFORMERS, TRANSFORMERS	Rs Cr 1.0 Approx 50 Ton	48043100	GE, ABB, CGL, and others

Components – Insulating Materials

Classification	Application	Requirement p.a. (Rs Cr)	HSN Code	Whether required by other clients
Cellulosic PAPER (for capacitors) As per IEC 60554-3-2 (IS:9335)	Capacitive Voltage Transformers (CVT)	Rs Cr 0.1 Approx 2 Ton	48025450	GE, ABB, CGL, Mehru Electricals and other CVT manufacturers

Components – Insulating Materials

Classification	Application	Requirement p.a. (Rs Cr)	HSN Code	Whether required by other clients
BOPP Films (for capacitors) Generally as per IS:11298	Capacitors	Rs Cr 2.0 Approx 75 Ton	39202090	GE, ABB, CGL, Mehru Electricals and others

HEP Bhopal

Electric Machines



Electric Machines

- Resin & Hardener
- Polyester Fibre fleece tape
- Semiconducting varnish

Sh A Tijare
Sr DGM ISE
HEP Bhopal

Components – Insulating Materials

Classification	Application	Requirement p.a.	HSN Code	Whether required by other clients
Resin and Hardener	Electric Machines	Rs Cr 3 75 MT	39073010 (Resin), 29172000 (Hardener)	Siemens, Crompton Greaves



Bisphenol A Epoxy resin (BHEL Bhopal spec. BP27664)
Anhydride hardener (BHEL Bhopal spec. BP27669)

VPI Resin and Hardener are very critical part of the AC machine's insulation and form the heart of machine. Any new manufacturer can be approved only after going through rigorous testing / trials of samples.

Components – Insulating Materials

Classification	Application	Requirement p.a.	HSN Code	Whether required by other clients
Resin and Hardener	Electric Machines	Rs Cr 3 75 MT	39073010 (Resin), 29172000 (Hardener)	Siemens, Crompton Greaves

- Present sources
 - Hexion, Germany
 - Huntsman, Switzerland
 - Aditya Birla, Thailand (Indian company who have taken over a company in Thailand to manufacture highest purity grade epoxy resin) – material to be supplied from Thailand
- This material is required worldwide by all the global VPI motor/ generator manufacturers
- EPOXY RESIN TECHNICAL REQUIREMENTS – EPOXY RESIN IS OF BISPHENOL A TYPE OF HIGHEST PURITY, VERY HIGH STABILITY AND LONG BATH LIFE. THE RESIN IS SO PURE THAT IT CRYSTALLIZES AT LOWER TEMPERATURES. ITS MANUFACTURING REQUIRES LOT OF DISTILLATION/ REACTION ETC. FOR MEETING THE ABOVE REQUIREMENTS. ALSO THE FACILITIES SHOULD CATER TO LARGE VOLUME REQUIREMENTS.

Components – Insulating Materials

Classification	Application	Requirement p.a.	HSN Code	Whether required by other clients
Resin and Hardener	Electric Machines	Rs Cr 3 75 MT	39073010 (Resin), 29172000 (Hardener)	Siemens, Crompton Greaves

- EVALUATION STAGES OF NEW VENDOR
 - TESTING OF MATERIAL AS PER BHEL BHOPAL SPECIFICATIONS
 - IR SPECTROGRAPHY TO MATCH THE MATERIAL SIGNATURE
 - LAB TRIALS
 - EVALUATION OF SAMPLES BARS/ COILS IMPREGNATED IN THIS RESIN
 - IMPREGNATION AND TESTING OF ACTUAL MOTORS

Components – Insulating Materials

Classification	Application	Requirement p.a.	HSN Code	Whether required by other clients
Polyester Fibre fleece Tape	Electric Machines	Rs Cr 0.67 18000 Sq m	85469090	ABB, Siemens, GE, Toshiba, CGL, Andritz (Similar material)



BHEL Bhopal specifications BP23799 and In Sk 30360

These materials are required for inner and outer corona protection in resin rich and VPI design hydro generator stator bars and coils and for slot corona protection in VPI design stator coils for industrial motors.

This is a polyester fleece based material loaded with carbon / graphite to meet the defined conductivity and application parameters

Components – Insulating Materials

Classification	Application	Requirement p.a.	HSN Code	Whether required by other clients
Stress grading paint (Semi conducting varnish)	Electric Machines	Rs Cr 0.8 3000 Kg	85479090	ABB, Siemens, GE, Toshiba, CGL, Andritz



BHEL Bhopal specification In Sk 30368

Equivalent Von Roll Switzerland grade: 8001

This material is required for end corona protection in resin rich and VPI design hydro generator stator bars and coils.

This is a modified phenolic resin with semi-conductive filler (silicon carbide based) for use up to Class F (155°C).

The material is intended to be used up to rated voltages of 21 kV (test voltage up to 63 kV).

Components – Insulating Materials

Classification	Application	Requirement p.a.	HSN Code	Whether required by other clients
Conducting varnish (Low Ohmic grade)	Electric Machines	Rs Cr 0.15 500 Kg	3208	Siemens, GE, Toshiba, Andritz



BHEL Bhopal specification HW27870

Equivalent Von Roll Switzerland grade: 8003

This material is used for slot/ outer corona protection on the surface of stator bars of VPI design hydro generators.

The varnish is applied with brush on the insulation surface

It consists of alkyd resin as binding agent, solvents and graphite powder.

The material is intended to be used up to rated voltages of 21 kV (test voltage up to 63 kV).

Components – Insulating Materials

Classification	Application	Requirement p.a	HSN Code	Whether required by other clients
Stress grading tape	Electric Machines	Rs Cr 1.2 1.75 L meters	8546	ABB, Siemens, GE, Toshiba, CGL



BHEL Bhopal specification In Sk 46089 (Von Roll Switzerland grade 217.21) & Von Roll Switzerland grade 217.02

This material is required for end corona protection in VPI design stator coils of high voltage industrial motors

It is a woven polyester tape impregnated with electrically semi-conductive varnish in the 'B' stage for use up to Class F (155 deg C).

It should be compatible with epoxy anhydride impregnation resin systems

The material is intended to be used up to rated voltages of 13.8 kV (test voltage up to 29 kV).



Components – Insulating Materials

Classification	Application	Requirement p.a	HSN Code	Whether required by other clients
Foamed Polypropylene tape	Electric Machines	Rs Cr 0.2 3000 kg	85479090	ABB, Siemens, GE, Toshiba, CGL



IN.SK. 30350, M/s Lenzing Austria grade
FOAMED PP-FILM,PP-S

This material is required for release applications during hot pressing of stator coils and bars of industrial machines and hydro generators.

Based on – Polypropylene (monoaxially oriented)

Colour – Natural white (opaque)

Thickness – 0.13 mm



Components – Insulating Materials

Classification	Application	Requirement p.a.	HSN Code	Whether required by other clients
POLYESTER FIBRE REINFORCED POLYESTER FLEECE SHEET (BP23792)	Electrical Machines	Rs Cr 0.17 3000 Sq m	56021000	ABB, Siemens, GE, Toshiba, CGL, Marathon
ISOPHTHALATE VARNISHED POLYESTER FABRIC TAPE (AA23703)	Electrical Machines	Rs Cr 0.07 3.5 L meters	85361090	Siemens, GE, Toshiba
GLASS FIBRE MAT – 450 GSM (IN.SK. 46088)	Electrical Machines	Rs Cr 0.18 13000 MT	01011010	ABB, Siemens, GE, Toshiba, CGL, Marathon
EPOXY PRE-IMPREGNATED (B-STAGE) LONGITUDINALLY ORIENTED POLYESTER FLEECE (BP23793)	Electrical Machines	Rs Cr 0.025 1200 Sq m	8546	ABB, Siemens, GE, Toshiba, CGL, Marathon

HEP Bhopal Traction Machines



Traction Machines

- Silicon Impregnating Resin
- Polyimide film
- Polyamide paper
- Silicon rubber elastomer

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AGM TME
HEP Bhopal

Components – Insulating Materials

Classification	Application	Requirement p.a. (Rs Cr)	HSN Code	Whether required by other clients
SILICON IMPREGNATING RESIN (SILRES H62C) or equivalent	Traction Machines	Rs Cr 9 Approx 28 Ton	39100000	(Customer) -Indian Railways (Competitors) -Crompton Greaves. -Saini Electricals - Medha - WEG

Silicon impregnating resin SILRES H62C or equivalent

USE	For Vacuum Pressure Impregnation (VPI) of 3-ph Traction motors used in DEMU, AC-EMU, MEMU and Electric/Diesel locomotives.
NEED	<p>Traction motors are required to be very compact in design with high power requirement in the limited space. Due to fact high thermal grade impregnating resin of class 200 and above to be used. To withstand high temperature index, class 200 and above impregnating resin is essentially required to achieve performance of traction motors.</p> <p>Also above is Customer (Indian Railways) controlled material for 6FRA6068 & 6FXA7059, to be procured from customer approved vendors only as per contractual requirement.</p>
Item Description	SILRES H62C (M/s Wacker Chemi make) or equivalent
CONSTRAINT	Presently no Indian manufacturer offer this grade resin.



Resin



Stator after VPI



VPI plant

Components – Insulating Materials

Classification	Application	Requirement p.a. (Rs Cr)	HSN Code	Whether required by other clients
HILFSSTOFF 38 HZN 451560P	Traction Machines	Rs Cr 2.5 0.5 Ton	39119090	(Customer) -Indian Railways (Competitors) -Crompton Greaves. -Saini Electricals - Medha - WEG.

HILFSSTOFF 38

USE	HILFSSTOFF 38 is inhibitor of silicon impregnating resin used for VPI of 3-phase Traction motor used in Diesel, DEMU, AC EMU and Electric locomotives.
NEED	<p>Traction motors are required to be very compact in design with high power requirement in the limited space. Due to fact high thermal grade impregnating resin and its inhibitor of class 200 and above to be used. To withstand high temperature index, class 200 and above impregnating resin and its inhibitor is essentially required to achieve performance of traction motors.</p> <p>Also above is Customer (Indian Railways) controlled material for 6FRA6068 & 6FXA7059, to be procured from customer approved vendors only as per contractual requirement.</p>
Item Description	HILFSSTOFF 38 (M/s ABB make)
CONSTRAINT	Presently no Indian manufacturer offer this grade inhibitor.



Stator after VPI



VPI plant

Components – Insulating Materials

Classification	Application	Requirement p.a. (Rs Cr)	HSN Code	Whether required by other clients
POLYIMIDE (KAPTON/APICAL) FILM/ TAPE for DC & AC machines 0.125 x 510 MM POLYIMIDE FOIL PI-FO1 (KAPTON)	Traction Machines	Rs Cr 2.3 210 Kg	3920992000	(Customer) -Indian Railways (Competitors) -Crompton Greaves. -Saini Electricals - Medha - WEG.

Polyimide (Kapton/ Apical) film / tape

SIZE	Mil : 1 (0.025 mm) , 2 (0.05 mm) & 5 (0.125 mm)
USE	For inter-turn & ground insulation of copper magnet wire used in DC Traction machines and 3-Phase traction motor.
NEED	Traction machines are very compact design and required high power to weight ratio. Due to fact high thermal grade insulating materials of class 200 and above to be used. To withstand high temperature index , polyimide film insulation is essentially required.
EXPLANATION	Polyimide (Kapton/ Apical) film/ tape as per <u>BP22996</u> & <u>TM 10412</u>
CONSTRAINT	Presently no Indian manufacturer offer this grade polyimide film .



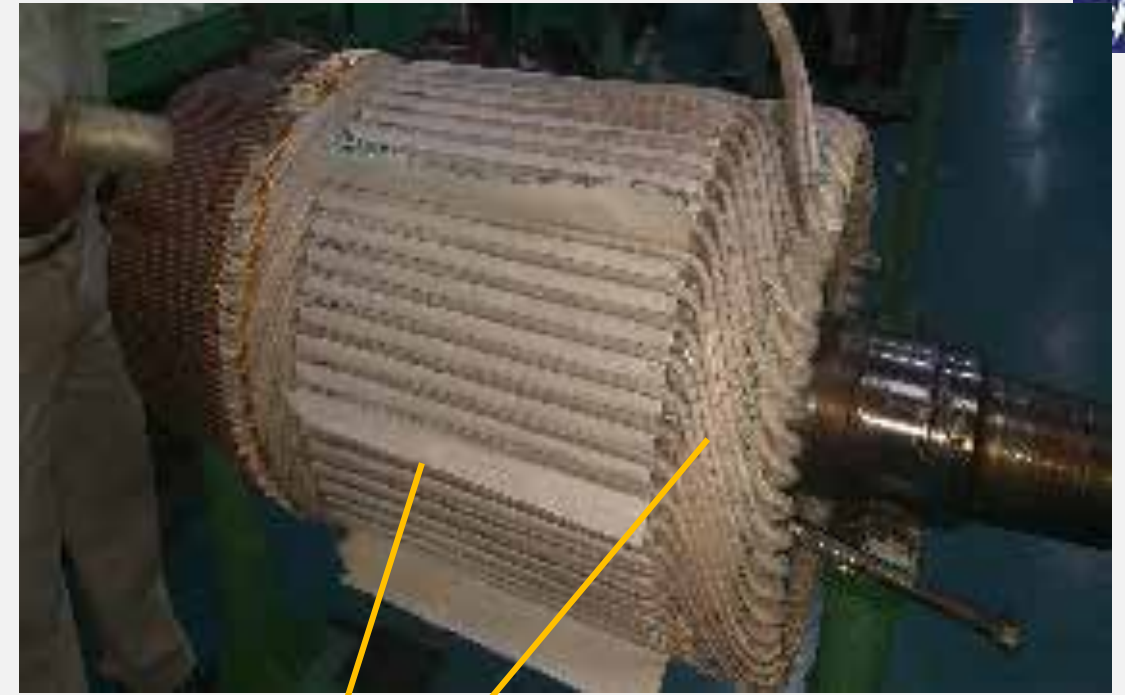
Polyimide film

Components – Insulating Materials

Classification	Application	Requirement p.a. (Rs Cr)	HSN Code	Whether required by other clients
POLYAMIDE (CALENDER PAPER) NOMEX #1) 0.18 x 914 mm ,#2)0.25 x 914 mm ,#3) 0.51 x 914 mm and #4) 0.76 *914 mm FOR	DC & AC Machines Traction Machines	0.4	56039200	(Customer) -Indian Railways (Competitors) -Crompton Greaves. -Saini Electricals

Polyamide (Calendar paper) Nomex

SIZE	0.18 x 914 mm 0.25 x 914 mm 0.51 x 914 mm 0.76 x 914 mm
USE	For interturn and ground insulation of DC Traction machines and 3- Phase traction motor.
NEED	Traction machines are very compact design and required high power to weight ratio. Due to fact high thermal grade insulating materials of class 200 and above to be used. To withstand high temperature index , polyamide paper insulation is essentially required.
EXPLANATION	Polyamide (Calendar paper) Nomex as per <u>TM10477</u>
CONSTRAINT	Presently no Indian manufacturer offer this grade polyamide paper.



**Polyamide
tape/paper**

Components – Insulating Materials

Classification	Application	Requirement p.a. (Rs Cr)	HSN Code	Whether required by other clients
SILICON RUBBER FIBRE GLASS TAPE & WRAPPER	Traction Alternator	Rs Cr 0.2	8547	(Customer) -Indian Railways (Competitors) -Crompton Greaves. -Saini Electricals 9090

Silicon rubber fibre glass tape & wrapper

SIZE	0.5 mm thk. tape/ wrapper
USE	For stator coil insulation of Traction Alternator used in Diesel locomotives.
NEED	Silicone rubber glass tape/wrapper is a special type of critical insulating material used as main insulation of stator coil of traction alternator. This is B-stage insulating material provides sealed insulation system after vulcanization process resulting into robust/low hygroscopic insulating system. This insulation system is essentially required to provide sealed insulation and protect from diesel fume, dust and dirt generated by diesel engine.
EXPLANATION	Silicon rubber fibre glass tape & wrapper as per <u>TM00285</u>. (M/s Arlon USA make)
CONSTRAINT	Presently no Indian manufacturer established this type of material.



Silicone rubber
fibre glass
wrapper



Silicone rubber
fibre glass tape



Wound stator of
Alternator

Components – Insulating Materials

Classification	Application	Requirement p.a. (Rs Cr)	HSN Code	Whether required by other clients
RTV (SILICONE RUBBER ELASTOMER RT 622 A/B OR EQUIVALENT) for AC machines,	Traction Machines	Rs Cr 1.2 8000 Kg	32141000	(Customer) -Indian Railways (Competitors) -Crompton Greaves. -Saini Electricals

Silicone rubber elastomer RT622 A/B or equivalent

USE	Pourable two-component silicone rubber that vulcanizes at room temperature used for encapsulation of 3-phase Traction motor winding used in Diesel, DEMU, AC EMU and Electric locomotives.
NEED	<p>Traction motors are required to be very compact in design with high power requirement in the limited space. Due to fact high thermal grade compound of class 200 and above to be used. To withstand high temperature index, class 200 and above compound is essentially required to achieve performance of traction motors.</p> <p>Also above is Customer (Indian Railways) controlled material for 6FRA6068 & 6FXA7059, to be procured from customer approved vendors only as per contractual requirement.</p>
EXPLANATION	Silicone rubber elastomer RT 622 A/B or equivalent as per <u>TM11520</u> (Make - M/s Wacker Chemi/ Germany, M/s Dow Silicones Corporation/USA, M/s Altropol Kunststoff /GMBH Germany.)
CONSTRAINT	Presently no Indian manufacturer offer this grade



Silicone rubber elastomer compound



Transformer Plant, Jhansi Transformers



Transformer (Jhs)

- Flexible high temp laminate
- Fibre glass tape
- Pigment for epoxy resin
- Double adhesive paper tape

Sh N N Ramn
AGM TRE
TP Jhansi

Components – Insulating Material (JHS)

Classification	Application	Requirement p.a. (Rs Lakhs)	Use	Need
Nomex (Aramid) paper	Transformers	90	Used for taping & insulation	Nomex paper is specifically used for transformers demanding high temperature withstand capability & high electrical stresses.
Double adhesive paper tape	Transformers	1.5	Used for holding layer insulation papers	To hold the interlayer insulation papers from slipping during winding & tapping.
Pigment for epoxy resin	Transformers	7.5	Added to epoxy resin mixture	To give desired color to the Dry type transformer casted coils.
Flexible high temperature laminates	Transformers	15	Used for making winding edge blocks/rolled components	Flexible high temperature laminates are used to make the edge blocks, dummy strips etc. for class-H insulated windings.

Components – Insulating Material (JHS)

Classification	Application	Requirement p.a. (Rs Lakhs)	Use	Need
Resin, Hardner for coil casting	Transformers	100	For casting of Dry type transformer coils	Pure Epoxy resin mixture is used to cast dry type transformer coils
Presspaper	Transformers	8.5	For winding interlayer insulation, bus bar/lead insulation etc.	To provide interlayer/ bus bar / lead insulation
Filament reinforced paper tape	Transformers	20	anchoring of transformer windings	To provide requisite mechanical strength to the coils
Prepregs	Transformers	50	for making winding edge blocks/ rolled components, winding spacers etc.	To make the edge blocks, support packing's etc. for windings
Fiber glass tape	Transformers	5	for anchoring of Dry type transformer coils	To provide requisite mechanical strength to the coils
Polyester tape	Transformers	5	for general purpose anchoring for transformers	To provide requisite mechanical strength

BHEL support for Development of Suppliers



24x7 Online portal for registration

- Simple registration form
- Timebound evaluation



Product development support

- Drawings, specifications
- Tooling



Hand holding with R&D and type testing



No LD/ penalty for developmental orders

BHEL support for MSMEs

MSMEs

PURCHASE PREFERENCE

As per Public Procurement Policy and MSMED ACT

ITEM PREFERENCE

358 items currently reserved for MSEs. When developed, items being imported can also be added to this list.

BILL DISCOUNTING

Payments through **TReDS** platform extended to all MSMEs

- RXIL Limited
- Invoice Mart
- M1Xchange

INTERACTIONS

Regular supplier meets.

BENEFITS

- EMD waived
- No elimination in RA
- Relaxation in prior experience and prior turnover to MSEs
- Time bound payments

BHEL support for Start-ups



BENEFITS

**Relaxation in prior
experience and turnover**



STARTUP RUNWAY

**BHEL is tendering its
requirements on GeM
wherein Startups can
supply goods as per the
Startup Runway on GeM**

Calendar for BHEL SAMVAAD

[Detailed list](#)

SNO	Category of Material	Date	Day	TIME
1	Raw Materials-Special/ Alloy/ Electrical Steel	29.12.2020	Tuesday	10:00 AM - 12:00 PM
2	Consumables for Foundry Applications	01.01.2021	Friday	10:00 AM - 12:00 PM
3	Welding Consumables of Special Grade	05.01.2021	Tuesday	10:00 AM - 12:00 PM
4	Castings & Forgings	08.01.2021	Friday	10:00 AM - 12:00 PM
5	Components-Mechanical	12.01.2021	Tuesday	10:00 AM - 12:00 PM
6	Insulating Materials	15.01.2021	Friday	10:00 AM - 12:00 PM
7	Components - Electrical & Electronics	19.01.2021	Tuesday	10:00 AM - 12:00 PM
8	Components – Solar	22.01.2021	Friday	10:00 AM - 12:00 PM
9	Systems & Packages	27.01.2021	Wednesday	10:00 AM - 12:00 PM

[Click here for filling up your details regarding your participation](#)

For any queries, please contact us on samvaad@bhel.in

Enrollment for BHEL SAMVAAD – Online Form submission

BHEL SAMVAAD

"An Interaction forum with local industry for strengthening the cause of Aatma Nirbhar Bharat"

***Required**

Supplier Name and address *

Your answer

Contact person Name *

Your answer

Contact person's email address *

Your answer

Contact person's Mobile No. *

Your answer

Category of Material (Kindly select your option, so that VC link is activated with you accordingly for the scheduled date and time) *

- ☐ General development & Engineering materials - 05/01/2021 - 10:00 AM - 12:00 PM
- ☐ Components for Family Appliances - 07/01/2021 - 10:00 AM - 12:00 PM
- ☐ Industrial Conversion of Special Grade - 08/01/2021 - 10:00 AM - 12:00 PM
- ☐ Castings & Forgings - 09/01/2021 - 10:00 AM - 12:00 PM
- ☐ Components for Locomotives - 10/01/2021 - 10:00 AM - 12:00 PM
- ☐ Insulating Materials - 15/01/2021 - 10:00 AM - 12:00 PM
- ☐ Components for Health & Medicines - 16/01/2021 - 10:00 AM - 12:00 PM
- ☐ Components for Air - 22/01/2021 - 10:00 AM - 12:00 PM
- ☐ Systems & Technologies for Control - 23/01/2021 - 10:00 AM - 12:00 PM

List of items proposed to be developed for BHEL *

Your answer

Submit



Thank You

THANK YOU

Write to samvaad@bhel.in to convey your interest