



# Indigenization of items & Development of local suppliers

*25<sup>th</sup> Nov 2024*

*Bharat Mandapam, New Delhi*

## Panel for Discussion

Name	Designation	Organization
Sh. Vinay Nigam	Executive Director	BHEL Jhansi
Sh. Mohan Rao	GM (Corp R&D)	BHEL Hyderabad
Ms. K P Mena	Additional Director (CDD)	CPRI, Bangalore
Sh. Surendra Singh	Under Secretary	DPIIT, Ministry of Commerce & Industry
Sh. Pankaj Kumar	Dy. Director (NFSG)	CEA, New Delhi

# Evolution of Public Procurement Policy – Make in India

PPP-MII Order  
2017

2017

Public Procurement (Preference to Make in India), Order 2017 Dtd 15.06.2017 - to promote manufacturing and production of goods & services in India

Works  
included

2018

PPP-MII Order partially modified on 28.05.2018 to include works (including turnkey works)

Partial  
modification

2019

PPP-MII Order partially modified on 29.05.2019 (only local suppliers eligible if sufficient local capacity is available)

Restriction  
on GTE

2020

PPP-MII Order partially modified on 04.06.2020 (Class I/ Class II local suppliers, no global tender above Rs. 5 Lakh and below Rs. 200 Cr. etc., unless approved by CA)

Type	Local content	Price preference
Class I	≥ 50%	✓
Class II	More than 20% but less than 50%	X
Non Local	≤ 20%	X

Notification  
on Countries  
sharing land  
border

2020

DoE Order dated 23.07.2020 (Bidders from countries sharing land borders to be registered with DPIIT)

Notification  
on Countries  
sharing land  
border

2023

DoE Order dated 23.02.2023 (Includes even TOT from Bidders from countries sharing land borders to be registered with DPIIT)

PPP-MII  
Order (Rev)

2024

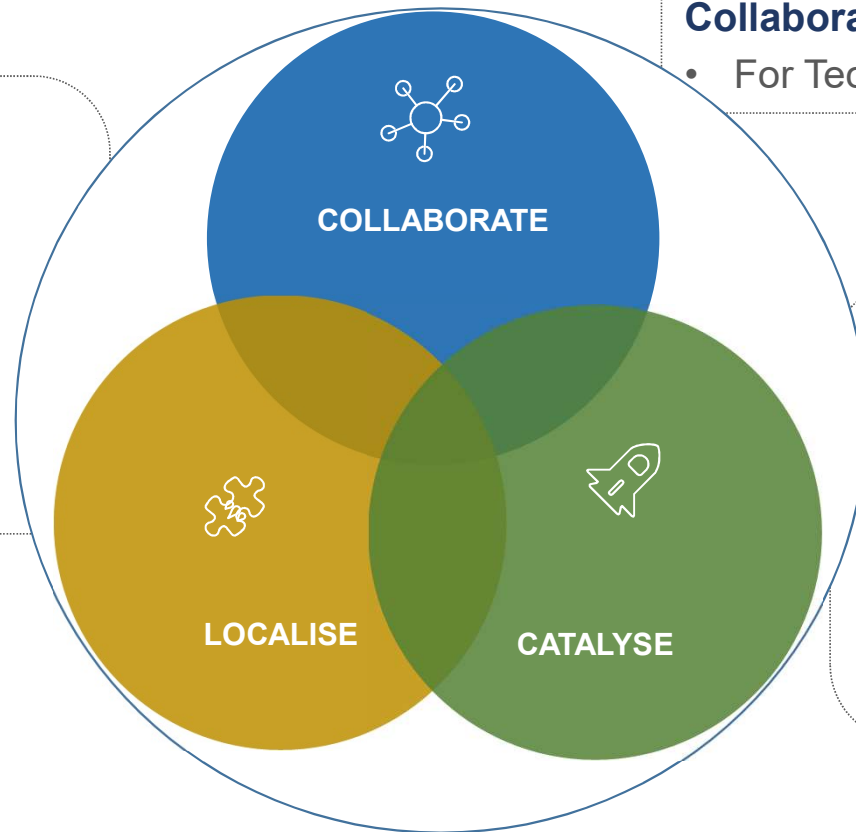
DoE Order dated 19.07.2024 (Rebranding, repackaging, refurbishing not considered as value addition ; 10% of contract value would be deducted in case false MII declaration)

# BHEL's Framework for AtmaNirbhar Bharat

## Localise

Import substitution through

- in house engineering or manufacturing
- supporting domestic manufacturers for indigenization



## Collaborate

- For Technology and Manufacturing

## Catalyse

- Enable solutions for challenges faced in engineering and manufacturing
- Support domestic ecosystem with R&D and Testing infrastructure

**Indigenized offerings with Indigenized supply chain**

# BHEL's Outreach Initiatives

COLLABORATE

April '20

**Expression of Interest ( 29.04.20 )**

Manufacturing in India with BHEL

July '20

**SANYOJAN ( 03.07.20 )**

Domestic Collaborations for Manufacturing

Aug '20

**SANRACHNA ( 24.08.20 )**

Technology Innovation Platform

CATALYSE

Nov'20

**Expression of Interest ( 13.11.20 )**

for import substitution

**Interaction ( 18.11.20 )**

with IEEMA

LOCALISE

Dec '20 – Oct'23

**Interaction ( 03.12.20 )**

with Local industry ( coordinated by DPIIT)

**SAMVAAD 1.0 ( 21.12.20 – 11.02.22 )**

Workshops with Local industry

**SAMVAAD 2.0 ( 28.10.22 – 29.11.22 )**

Workshops with Local industry

**SAMVAAD 3.0 ( 09.11.23 – 06.08.24 )**

Workshops with Local industry

**SAMVAAD 4.0 ( 25.11.24 – .. )**

Workshops with Local industry

## Items imported hitherto where local suppliers have been developed – Post SAMVAAD 2.0

Orders Placed			
Sl.	Item description	Source identification through	Supplier, M/s
1	2 mm sheets & 6 mm Plates of C276 grade	BHEL-SAMVAAD	MIDHANI, Hyderabad
2	C276 Cladded Plate through Hot rolling (1250 mm width)		Jindal Stainless Limited
3	Tubes of grade: SA312TP304 H/347 H, SUP 304 SS		Tubacex Tubes & Pipes
4	Tubes of grade: SA213TP347H SS, SA213TP340H SS		Welspun Specialty Solutions Ltd
5	SA312TP304 SS Tubes		Ratnamani, Gujarat
6	SA335P22 Alloy steel Pipes (upto OD 355.6 mm and thickness upto 14.27 mm)		Maharashtra Seamless Ltd.
7	Spray pipes		Sunrise Industries, Vadodara
8	Spray nozzles		Lechler, Thane
9	Synthetic Ester Oil		Savita Oil, Silvassa
10	Hydrogenerator shaft forgings (36.3 MT)		LTSSHF, Mumbai
11	Hemispherical Dished ends SA234WP91		CHW Forge, Ghaziabad
12	RIP Bushings (245 kV)		Yash High Voltage, Vadodara Massa Izolyator Mehru, Gurugram
13	RIP Bushing (420 kV)		Siemens India Ltd. Hitachi Energy India Ltd

## Items imported hitherto where local suppliers have been developed – Post SAMVAAD 2.0

Orders Placed			
Sl.	Item description	Source identification through	Supplier, M/s
14	OIP Bushing (800 kV)	BHEL-SAMVAAD	CG Power and Industrial Solutions Ltd., Nashik
15	Insulated Rivetless Roller Bearings for Inverter side of Traction Motors		SKF India, Schaeffler India
16	Auxiliary Additive 3A 333 of VPI varnish		3A Associates, Mumbai
17	GT Blade Flats C450		Star Wire India Ltd,
18	GT Blade Flats SS403Cb		Laxcon, Ahmedabad
19	Compressor Journal/Thrust Bearings		MICHELL Bearings (INDIA) LLP
20	Maintenance Free Breather		EASUN-MR TAP Changers (P) Ltd. Precimeasure Control Pvt. Ltd.
21	Size -2 and Size-3 BUSHINGS for 36kV GIS		Radiant Enterprises
22	Absorber Re-circulation Pumps		KSB Ltd., Thane
23	Beech Wood Tangential Top Ring	Open Tender	Agya Enterprises, Bhopal Roechling Industrial India Pvt Ltd
24	Helical Wire Shock Mounting	GeM	Ridham Industries, Ahmedabad SEISMOSYS, Bangalore

## Items imported hitherto where local suppliers have been developed – Post SAMVAAD 3.0

Orders Placed			
Sl.	Item description	Source identification through	Supplier, M/s
25	Isothermal Tiles	BHEL-SAMVAAD	Thermoflyde Industries Private Limited, Gujrat Carborundum Universal LTD, Chennai Ganeshas Lime And Minerals, Ahmedabad
26	Chromite Sand		Khemka Refractories, Odisha
27	Welding Electrode (Tungsten based)		D & H Secheron Electrodes, Mumbai
28	16Mo3 Forgings & SA350LF2 Forgings		Bharat Forge, Pune
29	DIN EN 10028-7-1.4550 SS Plates		Jindal Stainless Limited, Hissar
30	FIN FLAT 89.7 x 6 - SA387GR12CL2		Evonith Value Steel Ltd, Hyderabad
31	Forged Elbow- D42.4X8.8/D38.1X7.11 F12CL2		Suhani Alloys Pvt Ltd, Faridabad
32	AS Round Bar Dia 200MM - SA213GrT91		Laxcon Steels Limited, Ahmedabad
33	CRNGO 270 Grade		JSW, Bellary
34	Field lead Core Bar	Open tender	IMA, Kolkata
35	Exciter Half ring Forging		IMA, Kolkata
36	Epoxy Glass Fabric tape used as Rotor Inter Turn Insulation		Sahney Insulation Group, Nasik
37	Nomex Interturn Tape		Sahney Insulation Group, Nasik



## Items imported hitherto where local suppliers have been developed – Post SAMVAAD 3.0

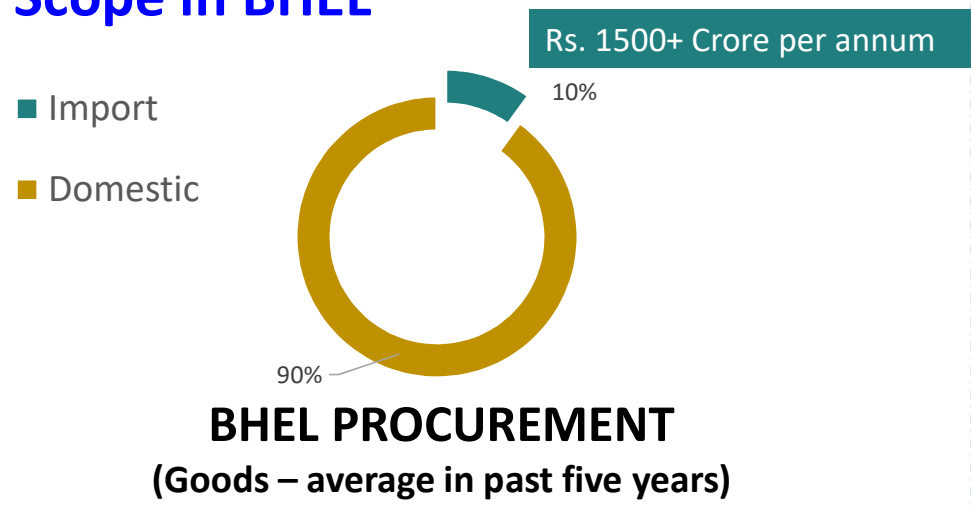
Orders Placed			
Sl.	Item description	Source identification through	Supplier, M/s
38	Magnetic Shunt Paper	BHEL-SAMVAAD	Isovolta (I), Nasik Senapathy Symons, Bengaluru
39	Mica Paper Glass tape with accelerator		Isovolta (I), Nasik Lakshmanan Isola, Bengaluru
40	Angulating Spring Support with Weld on Bracket		Lisega, India
41	Electro hydraulic actuators of Turbine valves		Bosch Rexroth India
42	Oil Module		Hydac, Coimbatore
43	Oil Throttle Valve		Hawa Valves, India
44	Gun Barrel Assembly		M/s Advance Weapons Equipment India Ltd.(AWEIL), Kanpur
45	Heat Sink, Water Cooled		Thermovac Aerospace, Bengaluru Perfect Machining centre Vinayaka CNC
46	FEMALE QUICK COUPLINGS		Ritra Technologies, Bhopal
47	Wire silicone 0.5sqmm 20kV RED		Thermo Cables Ltd
48	CURRENT TRANSDUCER 1000A/250MA		Electrohms Pvt Ltd
49	CAP POLYPROP MTL 1MF 10% 1400V		Advacne Components & Instruments
50	Centrifugal Fan		Superior Electric Machines Pvt. Ltd.

## Items imported hitherto where local suppliers have been developed – Post SAMVAAD 3.0

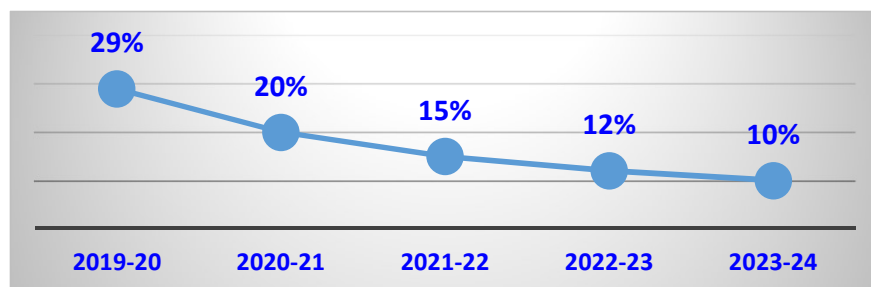
Orders Placed			
Sl.	Item description	Source identification through	Supplier, M/s
51	Resistors(3T)	BHEL-SAMVAAD	Precision Electronics Ltd., Noida
52	DC Earthing switch		Patra & Chanda, Howrah
53	Silicone Oil		Elkay Chemicals, Pune
54	FG Mat		Pliogrip Resins and Chemicals, Thane Fibreglass Insulation, Bhopal
55	HPH Tube sheet Forgings		CHW Forge Pvt ltd., Ghaziabad L&T Special Steels &Engg, Hazira
56	Compressor casing Forging		L&T Special Steels &Engg, Hazira
57	Fr-5 stg#1 Bucket casting		Indo MIM, Andhra Pradesh
58	Fr-6B Turbine Casting		Vimal Alloys, Ludhiana
59	Fr-6B CDC Casting		Vimal Alloys, Ludhiana

# Opportunity for Indigenization

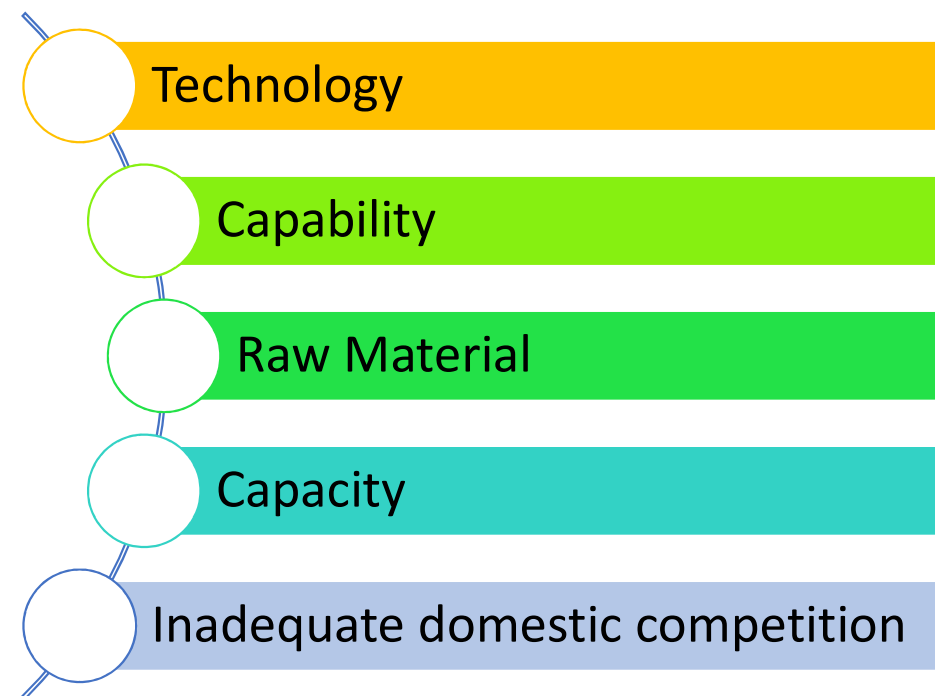
## Scope in BHEL



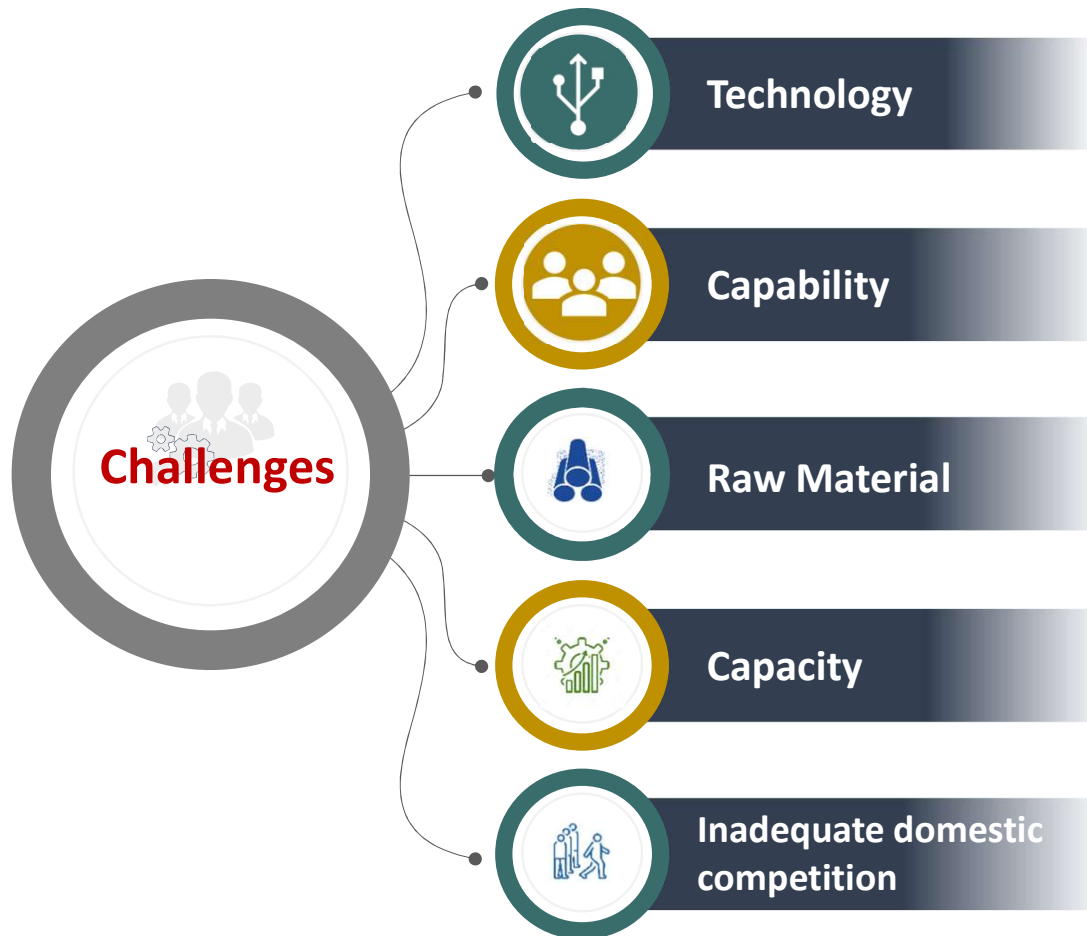
Trend of Imports in BHEL during the last few years



## Overcoming the challenges...



## Demand-supply gap – Few examples



### Examples

Generator Circuit Breakers, Boiler Water Circulating Pumps, Integrated Electronic devices, Current Insulated Bearings, Solar Ingots and Wafers

LP & TG Forgings > 50 MT, HP & IP Forgings <50 MT, Retaining ring forgings, C276 sheets, Titanium Sheets, A516 Gr.70 Plates (T> 115 mm), A515Gr.70Plates (T>150 mm)

### Nickel

Cladded sheets, Alloy Steel pipes & tubes (P91/ 92, T91/ 92)

Pressurization system for Motors, Armature Reversing Contactor, Mono PERC solar cells, Gypsum Dewatering System, Steel Plates (T> 120 mm)

# BHEL SAMVAAD

An opportunity for local vendors to meet the Demand – Supply gap

8

**Categories**

200+

**Items**

16

**Manufacturing Units**

2000+

**Crores per annum**

- Special Alloy Steels, Pipes and Tubes (P91/ 92 Pipes, T91/92 Tubes, etc)
- Special / Alloy / Electrical Steel
- Items for FGD
- Castings & Forgings
- Insulated rivetless and antifriction bearings
- Electrical Insulating Materials
- Electrical , Electronic & Solar items, Advance propulsion systems
- Systems/ Packages

## What's new in SAMVAAD 4.0



1.

### **Focus**

on the core few,  
where gaps in  
technology /  
facilities are  
prominent



2.

### **Collaborate**

Invite ideas from the  
domestic industry and  
academic / research  
institutions on how, as  
part of a joint effort with  
BHEL, one can not only  
minimize the imports in  
the Country but also  
enhance capacities



3.

### **Deliberate**

on inputs w.r.t.  
technical  
alternatives



**Let's get down  
to business!**

# **Electrical Insulation Items**



Sl. No	Item Description	Application	BHEL Unit	HSN Code	Requirement per Annum
					Rs. Crs
1	<u>Silicon Impregnating Resin # (SILRES H62C) or equivalent</u>	Traction motor for Trainsets, metro, Loco, EMU & DEMU	HEP Bhopal	39100000	12.50
2	<u>Polyimide film/ tape as per IEC 60674-3-4 Sheet 4 Type 1</u>	Traction machine for Trainsets, metro, Loco, EMU & DEMU	HEP Bhopal	39100000	3.00
3	<u>Polybutadiene Varnish</u>	Traction Alternator for Diesel Electric Locomotive	HEP Bhopal	32089041	0.30
4	<u>Polyamide Paper</u> As per IEC60819-3-3	Traction machine for metro, Loco, EMU & DEMU & Transformer	HEP Bhopal	56039200	3.00

Sl. No	Item Description	Application	BHEL Unit	HSN Code	Requirement per Annum
					Rs. Crs
5	<a href="#">Bushing/Insulator</a>	Gas Insulated Switch gear	HEP Bhopal	8546	0.20
6	<a href="#">Epoxy Insulator</a>	Extra High voltage Gas-insulated switchgear	HEP Bhopal	8546	0.84
7	<a href="#">Precompressed Pressboard sheets</a>	Transformer	HEP Bhopal	8504	36.00
8	<a href="#">Beechwood Top ring</a>	Transformer	HEP Bhopal	8504	3.00
9	<a href="#">Cellulosic PAPER (for capacitors)</a>	Transformer	HEP Bhopal	4802	0.30
10	<a href="#">Bi-Axially Oriented Poly-Propylene (BOPP) Film</a>	Capacitors	HEP Bhopal	3920	4.00

Sl. No	Item Description	Application	BHEL UNIT	HSN Code	Requirement per Annum
					Rs. Lacs
11	<a href="#">Nomex/ Polyamide Paper</a>	Turbo-Generators	HEEP Hardwar	-	18.69
12	<a href="#">Nomex Board</a>	Turbo-Generators	HEEP Hardwar	-	18.34
13	<a href="#">Polypropylene Sheet</a>	Turbo-Generators	HEEP Hardwar	-	18.05
14	<a href="#">Conductive Polyester Fleece (OCP Wrapper)</a>	Turbo-Generators	Hardwar/ Hyderabad	-	12.61
15	<a href="#">Conductive Fleece tape (ICP Tape)</a>	Turbo-Generators	Hardwar/ Hyderabad	-	18.76
16	<a href="#">Conductive Hard Fleece Sheet</a>	Turbo-Generators	HEEP Hardwar	-	21.45

Sl. No	Item Description	Application	BHEL UNit	HSN Code	Requirement per Annum
					Rs. Lacs
17	<a href="#">Slot Top Ripple Spring</a>	Turbo-Generators	HEEP Hardwar	-	44.57
18	<a href="#">Slot Side Ripple Spring</a>	Turbo-Generators	HEEP Hardwar	-	50
19	<a href="#">Support Ring</a>	Turbo-Generators	HEEP Hardwar	-	289 (incl seal ring)
20	<a href="#">Seal Ring</a>	Turbo-Generators	HEEP Hardwar	-	289 (incl support ring)
21	<a href="#">Polyester Resin and Poly Iso-Cyanate Hardener</a>	Electrical Machines	HEEP Hardwar	-	1.37 (0.90+.47)
22	<a href="#">Insulating Red Enamel Paint</a>	Electrical Machines	HEEP Hardwar	-	0.037

Sl. No	Item Description	Application	BHEL Unit	HSN Code	Requirement per Annum
					Rs. Crs
23	<a href="#">Conducting Varnish (Low Ohmic grade)</a>	Electrical Machines	HEEP Hardwar	-	0.057
24	<a href="#">Semi Conducting Varnish</a>	Electrical Machines	HEEP Hardwar	-	0.1
25	<a href="#">Magnetic Steel Sheet Varnish</a>	Electrical Machines	HEEP Hardwar	-	0.25
26	<a href="#">Silicone Resin Compound and Silicone Rubber Hardener</a>	Electrical Machines	HEEP Hardwar	-	0.2
27	<a href="#">Silicone Resin Compound and Catalyst</a>	Electrical Machines	HEEP Hardwar	-	0.369
28	<a href="#">Silicone Carbide Powder</a>	Electrical Machines	HEEP Hardwar	-	0.66
29	<a href="#">Chalk Powder and Calcite Powder</a>	Electrical Machines	HEEP Hardwar	-	0.01



**THANKS**

## Silicon Impregnating Resin for Traction Application

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UO M	Req p.a (qty )	Requirement p.a. (Rs Cr )		
Silicon Impregnating Resin # (SILRES H62C) or equivalent	For Vacuum Pressure Impregnation (VPI) of 3-ph Traction motors used in DEMU, AC-EMU, MEMU, Metro and locomotives application.	<a href="#">SILRES H62C</a> or Equivalent as per spec <a href="#">TM 20597</a>	HEP	Tonne	28 -30	12.5 for BHEL  25.0 for Country	39100000	(Customer) -Indian Railways  (Competitors) -Crompton Grieves -Saini Electricals -Medha Servo Drives -WEG
Special Features of the job		<ul style="list-style-type: none"> <li>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 or above to be used to achieve desired performance of traction motors.</li> <li>Presently liquid, Solventless silicon impregnating resin with viscosity of 1000 m Pas @ 25°C and 95 m Pas @ 80 °C is being used.</li> </ul>						
SN	Requirements of the job					Facility /Technology		Whether available in India (Yes / No )
1.	SILICON IMPREGNATING RESIN shall be approved from CLW/RDSO for regular supply for traction motor type 6FRA6068 and 6FXA7059.					Approval from CLW/RDSO as Technology of these motor are based on OEM design.		NO

## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category of Indian Railway	Number of indigenous vendor under trial/ development category	Status of indigenization
0	2	<ul style="list-style-type: none"> <li>• M/s 3A Associates Incorporated – Mumbai. Material under development by vendor.</li> <li>• M/s Advanced Silicones Pvt. Ltd. – Material under development by vendor.</li> <li>• As per information available no establish indigenous vendor for supply of Silicon Impregnating Resin.</li> <li>• Regular procurement of resin for 6FRA6068 shall commence only after approval by Indian Railways (CLW).</li> </ul>



## Silicon Impregnating Resin for Traction Application



Resin



Stator after VPI



VPI plant



## Polyimide Film Insulation for Traction Application

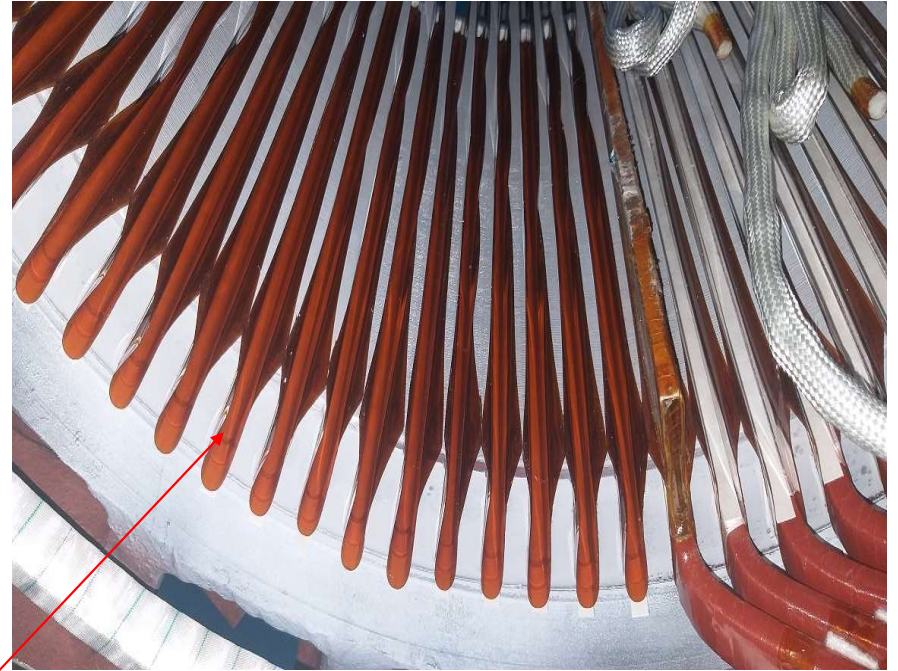
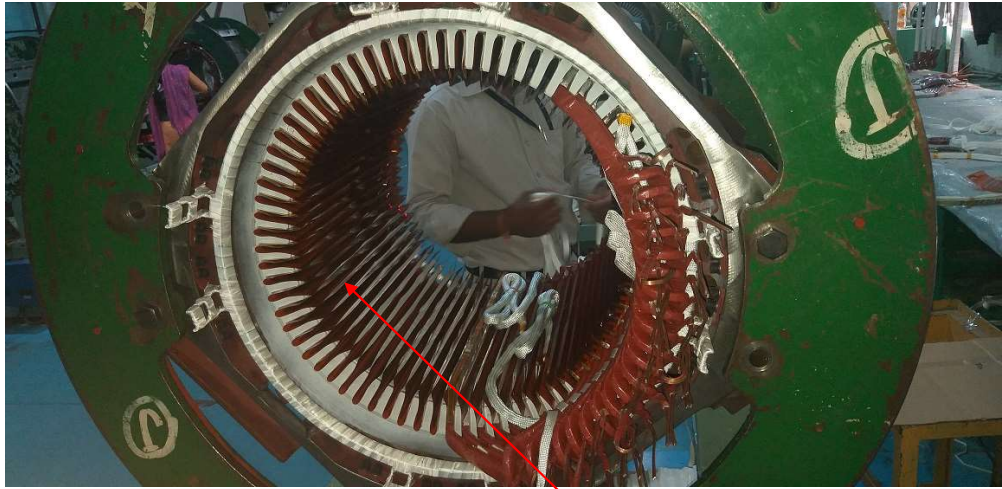
BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit of (Approx)	UOM	Req p.a qty	Requirement p.a. (Rs Cr )		
Polyimide film/ tape as per IEC 60674-3-4 Sheet 4 Type 1	For slot liner insulation, inter-turn & ground insulation of copper magnet wire used in AC & DC Traction machines.	Polyimide film/ tape as per IEC 60674-3-4 Sheet 4 Type 1	HEP Bhopal	Kgs	2000	2.5 for BHEL  7.5 for Country	3920992000	(Customer) -Indian Railways  (Competitors) -Crompton Grieves -Saini Electricals -Medha Servo Drives -WEG
Special Features of the job		Required size of film : 1 mil (0.025 mm) , 2 mil (0.05 mm) & 5 mil (0.125 mm) Traction machines are very compact design and required high power to weight ratio. Due to fact high thermal grade insulating materials of class 200 or above to be used to achieve desired performance of traction machines.						
Sl.	Requirements of the job				Facility /Technology		Whether available in India (Yes / No )	
1.	Polyimide film/ tape shall be approved from CLW/RDSO for regular supply for traction motor type 6FRA6068 and 6FXA7059.				Approval From CLW/RDSO		No	

## Efforts & Status Of Indigenization

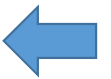
Number of indigenous vendors under approved category	Number of indigenous vendor under trial/ development category	Status of indigenization
0	0	<ul style="list-style-type: none"><li>• Procurement as per IEC 60674-3-4 Sheet 4 Type 1 started.</li><li>• OEM (Dupont &amp; Kaneka) of POLYIMIDE FILM are foreign based, however value addition like slitting, packing, after sale service support is done by OEM authorized/other Indian vendors. They are supplying polyimide film to BHEL as class-II local suppliers.</li></ul>



## Polyimide Film Insulation For Traction Application



Polyimide film



## Polybutadiene Varnish For Traction Application

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit (Approx)	UOM	Req P.a qty	Requirement p.a. (Rs Cr )		
Polybutadiene varnish	For Vacuum Pressure Impregnation (VPI) & dipping of Traction Machine used in Diesel Electric locomotives.	Polybutadiene varnish <u>Sterling® PB 302-LV-2</u> or equivalent as per TM 22603	HEP Bhopal	Kgs	3000	0.45 For BHEL	39100000	(Competitors)  -Crompton Grieves -Saini Electricals
Special Features of the job		<ul style="list-style-type: none"> <li>• This varnish is suitable for Dipping/ VPI application.</li> <li>• Superior Electrical properties at elevated temperature.</li> <li>• Moisture &amp; chemical resistant.</li> <li>• Compatible with Semi cured Silicone Rubber glass based &amp; glass mica insulation system.</li> <li>• Presently liquid, unsaturated polybutadiene varnish with viscosity of 300-500 m Pas @ 25°C is being used.</li> </ul>						
Sl.	Requirements of the job			Facility /Technology			Whether available in India (Yes / No )	
1.	Polybutadiene varnish shall be approved from RDSO for Traction Alternator TA9901 for 4500 HP DE Locomotive.			Approval From RDSO			No	

samvaad@bhel.in

## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/ development category	Status of indigenization
0	0	<ul style="list-style-type: none"><li>• Open tender enquiry floated for identification of local suppliers. No response received.</li><li>• As per information available no indigenous vendor exist for manufacturing and supply of Polybutadiene varnish.</li></ul>

## Polybutadiene Varnish For Traction Application



Varnish



Wound Stator



VPI plant



Dipping tank



## Polyamide Paper For Traction Application

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit (Approx)	UOM	Req. p.a (Qty)	Requirement p.a. (Rs Cr )		
Polyamide Paper/Tape  As per IEC60819-3-3	For interturn and ground insulation of DC Traction machines and 3- Phase traction motor.	Polyamide Paper/Tape as per IEC60819-3-3	HEP Bhopal	Kgs	2000	1.2 for BHEL  2.0 for Country	56039200	(Customer) -Indian Railways  (Competitors) -Crompton Grieves -Saini Electricals -Medha Servo Drives -WEG
Special Features of the job		REQUIRED SIZE FOR TRACTION APPLICATION: (0.13, 0.18, 0.25, 0.51 & 0.76 mm) X 914 mm width Traction machines are very compact design and required high power to weight ratio. Due to fact high thermal grade insulating materials of class H & above to be used to achieve desired performance of traction machines.						
Sl.	Requirements of the job				Facility /Technology		Whether available in India (Yes / No )	
1.	Polyamide paper shall be approved from CLW/RDSO for regular supply for traction motor type 6FRA6068 and 6FXA7059.				APPROVAL FROM CLW/RDSO		Yes, Available in India through value addition suppliers	

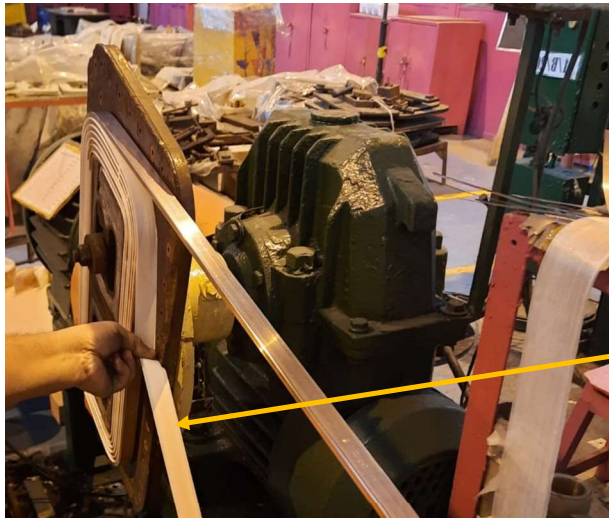
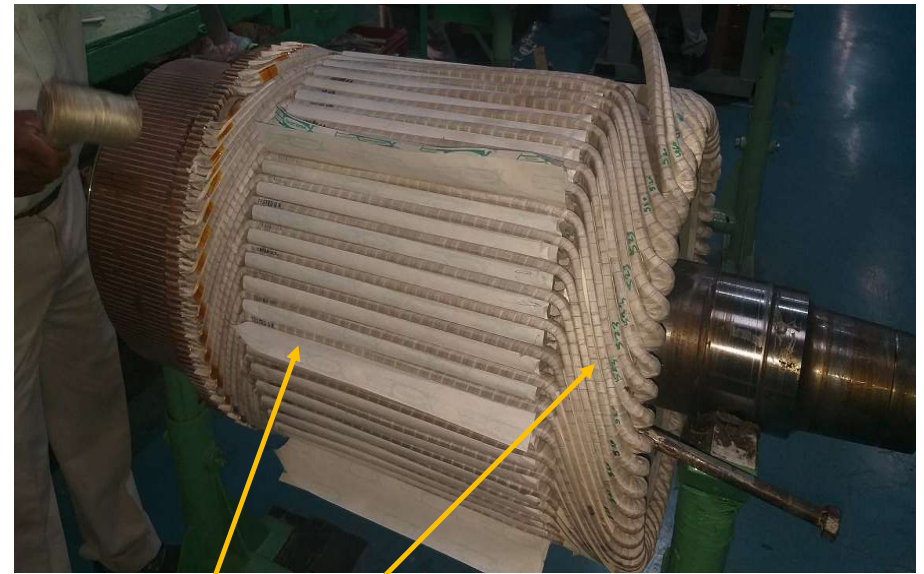
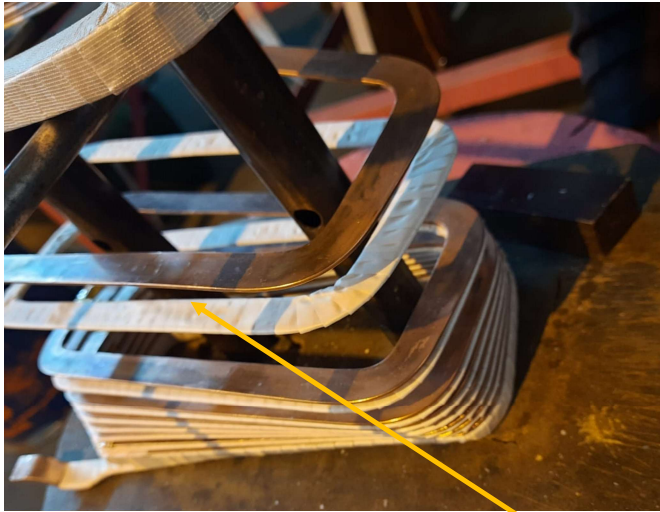
samvaad@bhel.in



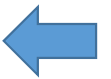
## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/development category	Status of indigenization
0	0	OEM of POLYAMIDE PAPER are foreign based, however value addition like slitting, packing., after sale service support is done by OEM authorized/other vendors. They are supplying polyamide paper to BHEL as class-II local suppliers.

## Polyamide Paper For Traction Application



Polyamide  
tape/paper



## Size2, Size3 and Size4 Bushing

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty)	Requirement p.a. (Rs Cr )		
Bushing/Insulator	For use with medium voltage Gas-insulated switchgear	SG12508	HEP Bhopal	No.	150	0.20	8546	Siemens
Special Features of the job		For terminating high voltage cables into gas insulated switchgear (GIS), including 33kV cable plug terminations. Size2- Max. operating voltage 42kV, Nominal current -630A Size3- Max. operating voltage 52kV, Nominal current -1250A Size4- Max. operating voltage 72kV, Nominal current -2000A						
Sl.	Requirements of the job			Facility /Technology			Whether available in India (Yes / No )	
1.	The Bushing shall able to bear the cable load (axial and radial) and No leakage			Proper raw material and sealing surface			Yes	
2.	The bushing shall be able to withstand desired voltage			Moulding with vacuuming			Yes	
3	The Bushing must be compact and able to carry rated current			Testing (HV and X-ray)			Yes	

samvaad@bhel.in

# Size2, Size3 and Size4 Bushing

## EFFORTS & STATUS OF INDIGENIZATION

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/ development category	Status of indigenization
1	0	1) Item developed by M/s Radiant Enterprises and used in commercial project 2) No GTE approval required now. 3) Being procured thru GeM.

## Size2, Size3 and Size4 Bushing



[samvaad@bhel.in](mailto:samvaad@bhel.in)



# Epoxy Insulator

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty )	Requirement p.a. (Rs Cr )		
Bushing/Insulator	For use with Extra High voltage Gas-insulated switchgear	SG16015	HEP Bhopal	Nos	40	0.84	8546	Siemens, ABB, GE
Special Features of the job		1) <b>Electrical Insulation:</b> Prevents current leakage from conductors to the ground, handling up to 400kV. Provides a long creepage path to prevent surface tracking. 2) <b>Mechanical Support:</b> Holds conductors, resisting mechanical forces due to short circuit or mis-alignment 3) <b>Arc Resistance:</b> Resists electrical arcs during faults or switching operations.						

Sl.	Requirements of the job	Facility /Technology	Whether available in India (Yes / No )
1.	The Epoxy Insulator shall able to bear conductor load, the pressure differential and pressure generated at fault current	Proper raw material and manufacturing process	No
2.	The Epoxy Insulator shall able to carry the rated and fault current	Moulding with vacuuming	Yes
3	Testing of the epoxy insulator	Testing (HV and X-ray)	Yes

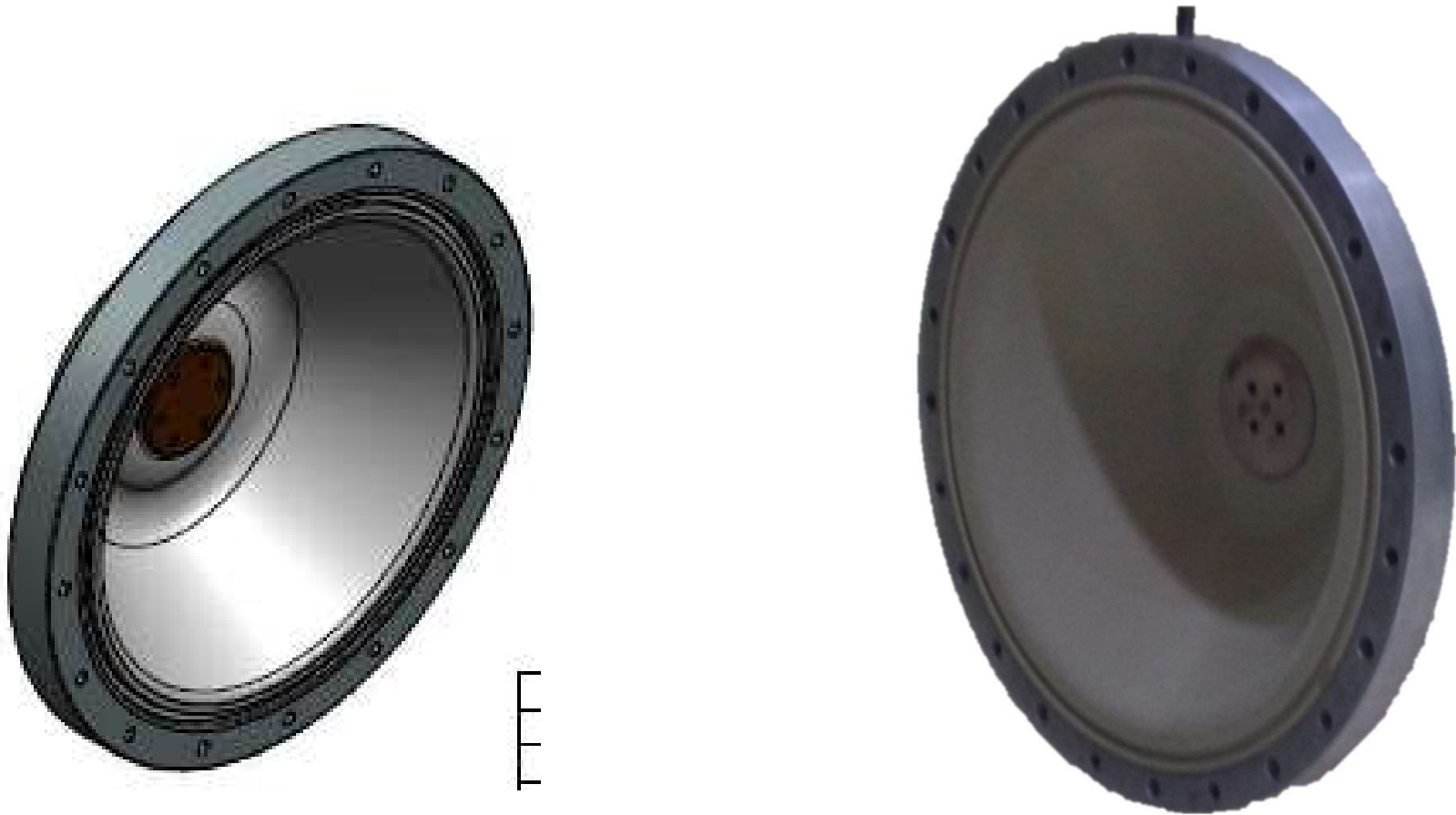
samvaad@bhel.in

# Epoxy Insulator

## EFFORTS & STATUS OF INDIGENIZATION

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/ development category	Status of indigenization
0	0	<ul style="list-style-type: none"><li>• Exploring Vendors with Expertise in Manufacturing 400kV and Above Epoxy Insulators for GIS.</li><li>• Expecting order from TS Genco for 40 Nos worth Rs 1.2 Cr</li></ul>

# Epoxy Insulator





# PRECOMPRESSED PRESSBOARD SHEETS

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Speci- fication	Unit	UOM	Requirement p.a. (Qty.)	Requirement p.a. (Rs Lac)		
Pre-compressed Pressboard Sheets (Solid and laminated)	Used as insulating material in transformers	IEC 60641-3-1 and IEC 60763	BHEL Bhopal	MT	1250	3600	85049010	All Power Transformer manufacturers
			Country	MT	10000	30000		ABB, Siemens, GE, T&R, TBEA, BTW, Toshiba
Special Features of the job		Major insulation item in Transformer and should have highest purity & quality with complying to all properties as per IEC standards. Raw material required is wood pulp from trees of specific species available in scandavian countries and RO / Deminralised water to ensure quality.						

S l.	Size Range Required	Facility required <i>Technology intensive item. Only general information mentioned.</i>	Facility available with Indian suppliers
1.	(VARIOUS SIZES FROM 1 MM TO 50 MM THICKNESS) Sheet size = 2100 x 3200 mm Minimum  (For higher range/ capacity of transformer = 3200 x 3200 or 2100 x 4200mm)	Washing/Drying facility for pulp	Available
		Pressing facility, cutting, sizing, oven drying facility	Press size constraint to make required size sheet
		Testing facilities for electrical and mechanical tests	Available

samvaad@bhel.in

## EFFORTS & STATUS OF INDIGENIZATION

Item Description	Number of indigenous vendors technically qualified	Number of indigenous vendor under trial/ development category	Status of indigenization
Pre-compressed Pressboard Sheets (Solid and laminated) meeting IEC 60641-3-1 and IEC 60763	-	-	<p>Indigenous source (Not approved for 800 kV class)</p> <p>Senapathy (Smaller sheet size)</p> <p>Hitachi, India</p> <p>Imported source (Approved for all voltage class)</p> <p>Enpay, Turkey</p> <p>Hitachi, Germany</p> <p>Weidmann Switzerland</p> <p>Kokusai Pulp (OJI) , Japan</p> <p>Krempel, Germany</p>

# PRE-COMPRESSED PRESSBOARD



## Thickness available

### Indigenous supplier

Solid Pressboard – 1 to 6mm

Laminated pressboard – 8mm & above

### Imported supplier

Solid Pressboard – 1 to 8mm

Laminated pressboard – 12 mm & above



## BEECHWOOD TOP RINGS

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.)	Requirement p.a. (Rs Lac)		
Beechwood Top Ring	Used as insulating material in transformers for mechanical pressing	IEC:61061	BHEL Bhopal	No.	130	300	85049010	All Power Transformer manufacturers ABB, Siemens, GE, T&R, TBEA, BTW, Toshiba etc.
			Country	No.	1250	2500		
Special Features of the job		Major component in Transformer for its mechanical integrity and should have highest purity & quality of wood veneers with complying to all properties as per IEC standards. Raw material required is wood veneers from trees of specific species available in arctic countries.						

S l.	Size Range Required	Facility required <i>Technology intensive item. Only general information mentioned.</i>	Facility available with Indian suppliers
1.	OUTSIDE DIAMETER FROM 1800 TO 2860 MM AND THICKNESS 50 TO 150 MM (Without joints)	Beech Wood Pressing & processing facility	Not available for required size
		Machining, drilling & handling facility	Available

samvaad@bhel.in

## EFFORTS & STATUS OF INDIGENIZATION

Item Description	Number of indigenous vendors technically qualified	Number of indigenous vendor under trial/ development category	Status of indigenization
Beechwood Top Ring to IEC: 61061	2	-	<p>Indigenous source (Only machining of raw material):</p> <ul style="list-style-type: none"> <li>• Agya Enterprises</li> <li>• Roechling Engineering India</li> </ul> <p>Indigenous source (Available for smaller size_thus not meeting requirement):</p> <ul style="list-style-type: none"> <li>• Surendra Composite</li> <li>• Parmali</li> </ul> <p>Imported source (Manufacturer of raw material):</p> <ul style="list-style-type: none"> <li>• Deutsche Holzveredelung Schmeing Gmbh &amp; Co. Kg., Germany</li> <li>• Roechling Engineering Plastics Se &amp; Co. KG, Germany</li> </ul>

## BEECHWOOD TOP RING



[samvaad@bhel.in](mailto:samvaad@bhel.in)



## Cellulosic Paper (for Capacitors)

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.)	Requirement p.a. (Rs Lac)		
Cellulosic Paper (Tissue paper for capacitors)	Capacitive Voltage Transformers (CVT)	IEC 60554-3-2 (IS:9335)	BHEL Bhopal	MT	30	660	48025450	GE, ABB, CGL, Mehru Electricals and other capacitor & CVT manufacturers
Special Features of the job		<ul style="list-style-type: none"> <li>Cellulosic paper (Tissue paper) for dielectric purpose made entirely from soft-wood pulp produced by the Kraft or modified Kraft process.</li> <li>Application: For dielectric purpose in the manufacturing of electrical capacitors.</li> <li>Higher Dielectric strength and fine thickness of the material in micron</li> </ul>						

Sl.	Size Range Required	Facility required <i>Technology intensive item. Only general information mentioned.</i>	Facility available with Indian Mills
1.	<ul style="list-style-type: none"> <li>Thickness: 12 microns</li> <li>Mineral ash: 0.4% (max)</li> <li>Tensile Strength (Min.) : MD – 60 Nm/g</li> <li>Apparent Density : 1.2 ± 0.05 g/cm<sup>3</sup></li> <li>Breakdown strength in Air (DC) : Min. 40 kV/ mm</li> <li>Moisture Content: 4 to 8%</li> <li>Paper width: 90, 162 mm</li> </ul>	Washing/Drying facility for pulp	Available
		Pressing facility, cutting, sizing, oven drying facility	constraint to make the required thickness of paper
		Testing facilities for electrical and mechanical tests	Available

samvaad@bhel.in

## EFFORTS & STATUS OF INDIGENIZATION

Item Description	Number of indigenous vendors technically qualified	Number of indigenous vendor under trial/ development category	Status of indigenization
Cellulosic Paper (for capacitors)	-	-	Open Tender floated to explore Indian manufacturers did not yield any results.  Currently being sourced from: <ul style="list-style-type: none"><li>• Glatfelter Germany</li><li>• Tervakoski Finland</li></ul>



## Cellulosic Paper (for capacitors)



[samvaad@bhel.in](mailto:samvaad@bhel.in)



## Bi-Axially Oriented Poly-Propylene (BOPP) Film

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.)	Requirement p.a. (Rs Lac)		
BOPP Film	Capacitors	IS:11298	BHEL Bhopal	MT	54	460	39202090	All capacitor & CVT manufacturers. GE, ABB, CGL, Mehru Electricals etc.
Special Features of the job		Balanced Bi-axially oriented polypropylene film for use as a capacitor dielectric having good resistance to dilute acids, alkalis, greases, oil and fats. Application: Used as dielectric for power, coupling and surge capacitors.						

Sl	Size Range Required	Facility required Technology intensive item. Only general information mentioned.	Facility available with Indian Mills
1.	<ul style="list-style-type: none"> <li>Both sides Hazy</li> <li>Nominal thickness- 9-15 micron, Width: 88, 160 and 320 mm</li> <li>Ash content : 0.4% max. Space factor : 6-13 %</li> <li>Breakdown strength in Air (AC) : Min. 300 kV/ mm</li> <li>Tensile Strength (Min.) : 110 N/ mm<sup>2</sup></li> <li>Elongation at Break (Min.) – 40%; Dielectric Constant – 2.2- 2.3</li> <li>Power factor at 100° C – 0.09% Max.</li> </ul>	Availability of Resin	Not available
		Processing of Resin to manufacture BOPP Film having both side haziness of fine thickness in the range of microns.	Not available

# Technology intensive item. Only general information mentioned.

samvaad@bhel.in

## EFFORTS & STATUS OF INDIGENIZATION

Item Description	Number of indigenous vendors technically qualified	Number of indigenous vendor under trial/ development category	Status of indigenization
BOPP Film	-	-	<p>M/s Xpro India Limited, a Birla Group company has shown interest. Technical specification provided.</p> <p>Currently being sourced from: Shin-Etsu Film Japan Bollere France, Tervakosky Finland</p>

## BOPP FILM



[samvaad@bhel.in](mailto:samvaad@bhel.in)



# **Electrical Insulation Items**

**HEEP HARIDWAR**

# 1. Nomex/ Polyamide Paper

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.) for 8 sets	Requirement p.a. (Rs Lac )		
Polyamide Paper (Nomex 410 Grade of M/s Dupont, USA)	Used as inter-turn insulation, slot liner of electrical machines.	AA22901	HEEP HARIDWAR	Kg	700	40	5603	All Electrical Industry BHEL Units – Hyderabad, Bhopal. Siemens/GE-Alstom/L&T
Special Features of the job		<ul style="list-style-type: none"> <li>It is made from specially formulated polyamide fibres with a high degree of thermal stability. The material is used up to a maximum operating temperature of 220°C.</li> <li>Thickness: 0.08, 0.13, 0.18, 0.25 &amp; 0.5mm &amp; Width: ~900 mm</li> </ul>						
SN	Requirements of the job				Facility /Technology		Whether available in India (Yes / No )	
1.	*Moisture Absorption = Maximum - 8%, *Volume Resistivity = Minimum - 1x10E16 Ohm-cm.				BHEL internal lab evaluation process		NO	

## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/ development category	Status of indigenization
3 ( 3 Indian value addition suppliers available)	0	<ul style="list-style-type: none"><li>• Presently being procured through Indian Authorized distributors with value addition of over 20%. ( Beico, India / Polycom, India/ Isovolta, India)</li></ul>

## Nomex / Polyamide Paper





## 2. Nomex Board

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.)	Requirement p.a.(Rs Lac)		
Nomex Board (Grade T-994 of M/s Dupont, USA)	Used as fillers in Generator Rotor End Winding	HW21788	HEEP HARIDWAR	Kg	200	24	8305	Electrical Industry Siemens/GE-Alstom/L&T
Special Features of the job		<ul style="list-style-type: none"> <li>It is a densified, rigid board (made of 100% Polyamide Fibre ) which has a unique combination of superior resistance to compression, even at elevated temperatures, along with relatively high oil absorption characteristics.</li> <li>Thickness: 4, 5, 6 mm &amp; Size: 360 x 1500 mm</li> </ul>						
SN	Requirements of the job				Facility /Technology		Whether available in India (Yes / No )	
1.	*Tensile Strength: MD/XD = ~110/65 N/mm <sup>2</sup> . * Elongation: MD/XD= 17-22%. *Heat Resistance: 220°C. *Elastic Modulus: ~3000 N/mm <sup>2</sup> . *Moisture Absorption=~4%. *Thermal Conductivity@150°C= 0.160 W/m°K. *Inorganic Residue after burning=~0.1%.				BHEL internal lab evaluation process		NO	

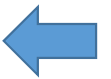
## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/ development category	Status of indigenization
3 ( 3 Indian value addition suppliers available)	0	<ul style="list-style-type: none"><li>• Presently being procured through Indian Authorized distributors with value addition of over 20%. ( Beico, India / Polycom, India/ Isovolta India)</li></ul>

## Nomex Board



**used as fillers in Generator Rotor End Winding**



### 3. Polypropylene Sheet

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.)	Requirement p.a. (Rs Lac )		
Polypropylene Sheet PPH Alphaplus Grade of M/s Simona, Germany & Polystone P Homopolymer grade of M/s Roechling, Germany	To prepare components used as packing/distance blocks in the end windings TGs.	TG60130	HEEP HARIDWAR	Kg	300	10	5402	Electrical Industry Siemens/ GE-Alstom/L&T
Special Features of the job		<ul style="list-style-type: none"> <li>These sheets are made of thermoplastic synthetic material (polypropylene) with stabilizers for raising the thermal, form change and light stability. It is suitable for use as a high value insulation material and is mouldable under the influence of heat. It has a limiting temp. of minimum 100°C.</li> <li>Thickness: 1, 2, 20, 26, 30, 80 &amp; 90mm (Size: 1000 x 2000 mm)</li> </ul>						
SN	Requirements of the job				Facility /Technology		Whether available in India (Yes / No )	
1.	*Compressive Yield Strength = Min.550kg/cm2. *Notch Impact = Min.4KJ/m2. *Bending E-Modulus = Min.1200N/mm2. * Melting Temp. (By DSC) = 155-165°C. *Plug Resistance (with 15mm gap) = Min.50 T-ohm. *CTI = Min.600 (375)M as per IEC60112.				BHEL internal lab evaluation process		NO	

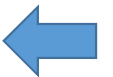
## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/ development category	Status of indigenization
0	0	<ul style="list-style-type: none"><li>• No vendor has shown interest so far.</li><li>• Presently being procured from Indian office M/s Simona, India / M/s Roechling, India</li></ul>

## Polypropylene Sheet



**Application: Used to prepare components for packing/distance blocks used in the TG end windings**



## 4. Conductive Polyester Fleece (OCP Wrapper)

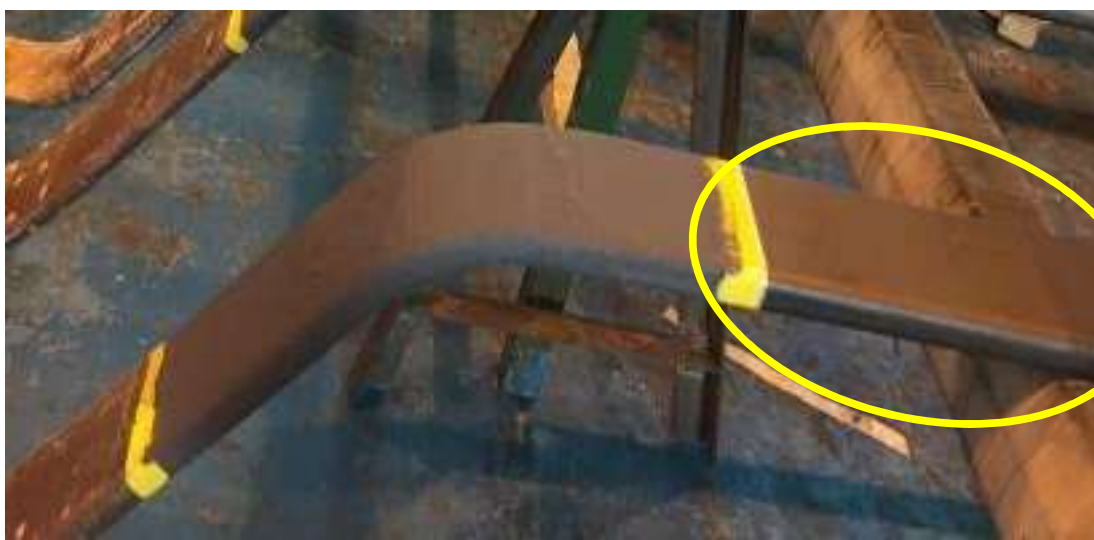
BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.)	Requirement p.a. (Rs Lac )		
Conductive Polyester Fleece (OCP Wrapper) (06ELR14CC of Krempel, Germany)	As wrapper on the TG bar surface by gluing with conducting varnish, to protect OCP paint from damage	HW22894	HEEP HARIDWAR	MR	1500	12	8503	BHEL Unit – Bhopal. Siemens/GE-Alstom/L&T
Special Features of the job		<ul style="list-style-type: none"> <li>It is a non-woven polyester fleece (recommended grade is of Quality H 3006 of Freudenberg, Germany), made electrically semi-conductive by impregnation with Graphite or carbon black pigmented synthetic resin (Limiting Temperature of 130°), compatible with impregnating resin system.</li> <li>Size: Thickness: 0.1+0.0/-0.03 mm, Width: Approx.1000mm</li> </ul>						
SN	Requirements of the job				Facility /Technology		Whether available in India (Yes / No )	
1.	*Surface Resistivity 3,000-10,000 Ohm/Sq.*Tensile Strength (Longitudinal/ Transverse) : Min. 3.0/0.7 N/mm width respectively. *Elongation Strength (Longitudinal/Transverse) : Max. 25/15% respectively.				BHEL internal lab evaluation process		NO	

## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/ development category	Status of indigenization
1 ( 1 Indian value addition supplier available)	1	<p>Development enquiry placed on M/s Isovolta (I), Nasik and is under progress.</p> <p>Presently being procured form Krempel, Germany/ Beico, India</p>



## Conductive Polyester Fleece (OCP Wrapper)



**Application as OCP paint protection wrapper in Manufacturing of TG winding bars.**



## 5. Conductive Fleece tape (ICP Tape)

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.)	Requirement p.a. (Rs Lac )		
Conductive Fleece tape (03_EFR_13_AA-S of Krempel, Germany)	Used as Internal Corona Protection between winding bar stack and main wall insulation. It is taped in slot portion over the stack before starting the main wall insulation.	HW23797	HEEP HARIDWAR	SM	2800	22	8503	Siemens/GE-Alstom/L&T
Special Features of the job		<ul style="list-style-type: none"> <li>Made from polyester fleece (recommended grade thread reinforced tensile strength Quality H 1603 of Freudenberg, Germany), impregnated with Graphite or carbon black pigmented synthetic resin (Limiting Temperature of 130°C) and Zinc Naphthenate/ Deca Zinc accelerator, compatible with impregnating resin system. (Impregnating Resin System: Resin: 'Bisphenol A' and Hardener : 'Anhydride' )</li> <li>Size: Thickness: 0.09+0.0/-0.02 mm, Width: 60±2 mm</li> </ul>						
SN	Requirements of the job				Facility /Technology		Whether available in India (Yes / No )	
1.	Surface Resistivity 750-3000 Ohm/Sq. *Resin Pollution test: When heated in Impregnating resin at a temp. ~75°C, it should not pollute the resin. *Tensile Strength (Longitudinal) : Min. 3.0N/mm width. * Elongation Strength (Longitudinal) : Max. 20%.				BHEL internal lab evaluation process		NO	

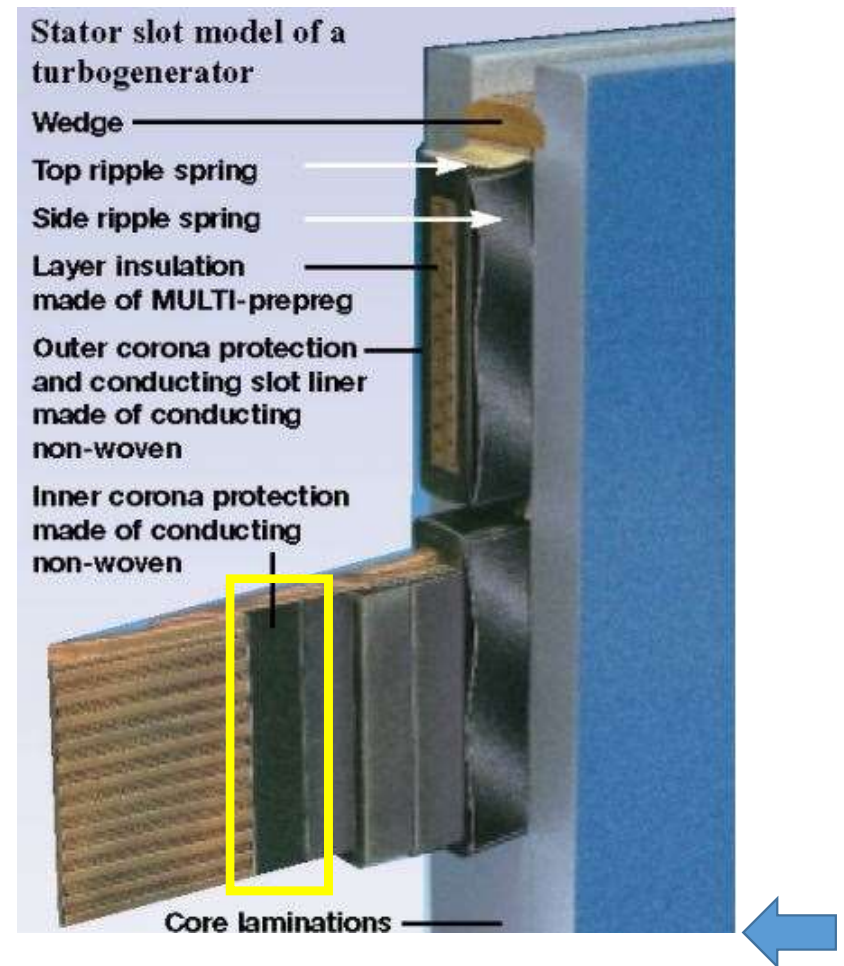
## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/ development category	Status of indigenization
1 ( 1 Indian value addition supplier available)	1	<p>Development P.O placed on Indian vendor (M/s Isovolta (I), Nasik).</p> <p>Presently being procured form Krempel, Germany/ Beico, India</p>

## Conductive Fleece tape



**Application as ICP tape in Manufacturing of Generator Winding bars**



## 6. Conductive Hard Fleece Sheet

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.) for 8 sets	Requirement p.a. (Rs Lac )		
Conductive Hard Fleece Sheet (Pregnit GGBE-R (PET fleece on both sides) of Krempel, Germany)	As bottom & side packing strip in the stator slots during winding assembly.	HW23768	HEEP HARIDWAR	Kg	160	16	8503	BHEL Units – Hyderabad, Bhopal. Siemens/ GE-Alstom/L&T
Special Features of the job		<ul style="list-style-type: none"> <li>It is made of several layer of glass cloth pre-impregnated with a carbon black filled thermosetting epoxy resin (Glass Transition Temp. of Min.130°C). The pre-impregnated glass cloth layers are pressed and hardened in a hot press. The cover layer of non-woven polyester is applied on both sided during the pressing process. Thickness: 0.3±0.06 mm, 0.5±0.1mm &amp; 1±0.1 mm</li> </ul>						
SN	Requirements of the job			Facility /Technology			Whether available in India (Yes / No )	
1.	<ul style="list-style-type: none"> <li>*Specific Surface Resistance is 1-200 k Ohm/sq.</li> <li>* Specific Volume Resistance is 1-600 k Ohm cm.</li> </ul>			BHEL internal lab evaluation process			NO	

## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/ development category	Status of indigenization
1 ( 1 Indian value addition supplier available)	1	<ul style="list-style-type: none"><li>• Development P.O placed on Sahney Kirkwood, Nasik.</li><li>• Presently being sourced from Krempel, Germany / Beico, India</li></ul>



## Conductive Hard Fleece Sheet



**Application as bottom & side packing strip in stator slot  
during Generator Winding bar assembly**



## 7. Slot Top Ripple Spring

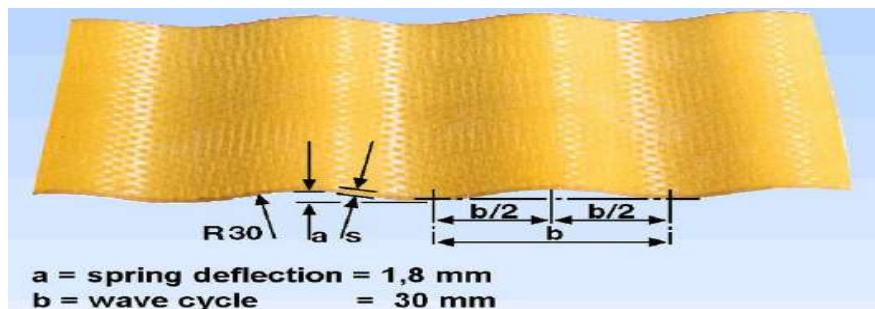
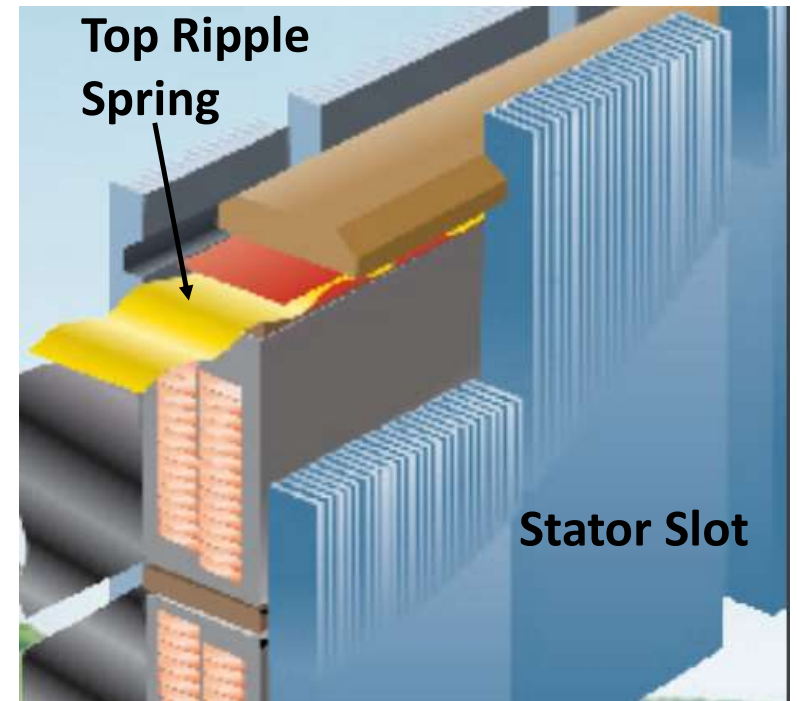
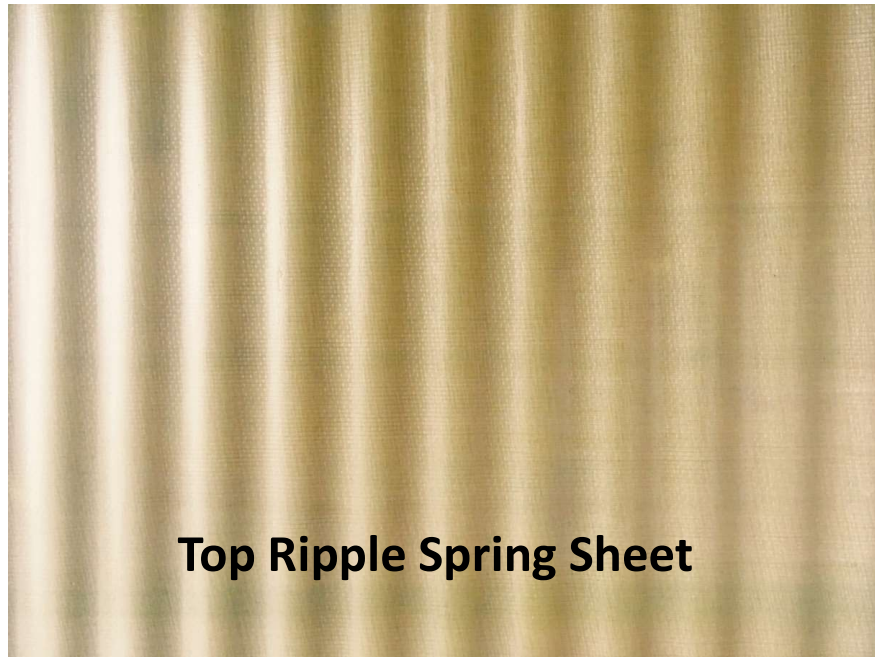
BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.)	Requirement p.a. (Rs Lac )		
Slot Top Ripple Spring (from Krempel, Germany)	As slot top packing between the stator bars and the slot wedges in large size TG, to suppress bar vibrations.	TG60135	HEEP HARIDWAR	Kg	410	85	85469090	BHEL Unit – Bhopal. Siemens/GE-Alstom/L&T
Special Features of the job		<ul style="list-style-type: none"> <li>It is made of glass fabric (200gsm cloth having Warp &amp;Weft : 6-8 threads/cm, with warp thread 15 times more in weight then that of weft thread) and synthetic resin (recommended grade Triazin-A of Bayer's, Germany or corresponding cyanate resin with Glass Transition Temp. of Min. 190°C). The material has ripple which runs at 90° w.r.t the cut edges.</li> <li>Thickness: 0.9 +0.2/-0.05 mm(0.85-1.10mm) &amp; Size: 480X1000mm</li> </ul>						
SN	Requirements of the job				Facility /Technology		Whether available in India (Yes / No )	
1.	*Glass Transition Temp of Min.190°C * Spring Characteristics should be linear upto 80% of Spring Travel. *Spring pressure @80% compression should be Min. 1N/mm2 and must not show any deformation after completing the test.* Flattening strength must be lower than CBS.*When kept in flattened condition at 120°C/7days, spring characteristics should not change except upto 15% decrease in spring travel & upto 25% decrease in spring pressure.				BHEL internal lab evaluation process		NO	



## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/ development category	Status of indigenization
1 ( 1 Indian value addition supplier available)	1	<ul style="list-style-type: none"><li>• Samples of M/s Sahney Kirkwood, Nasik under laboratory evaluation.</li><li>• Presently being sourced from Krempel, Germany/ Beico, India</li></ul>

## Slot Top Ripple Spring



Application in Generator Winding bar assembly



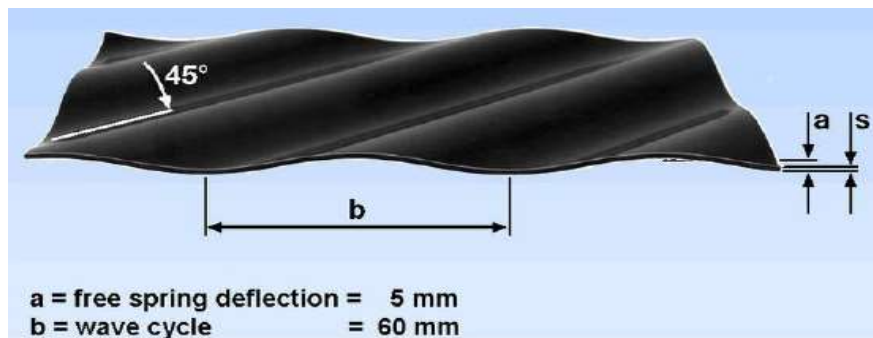
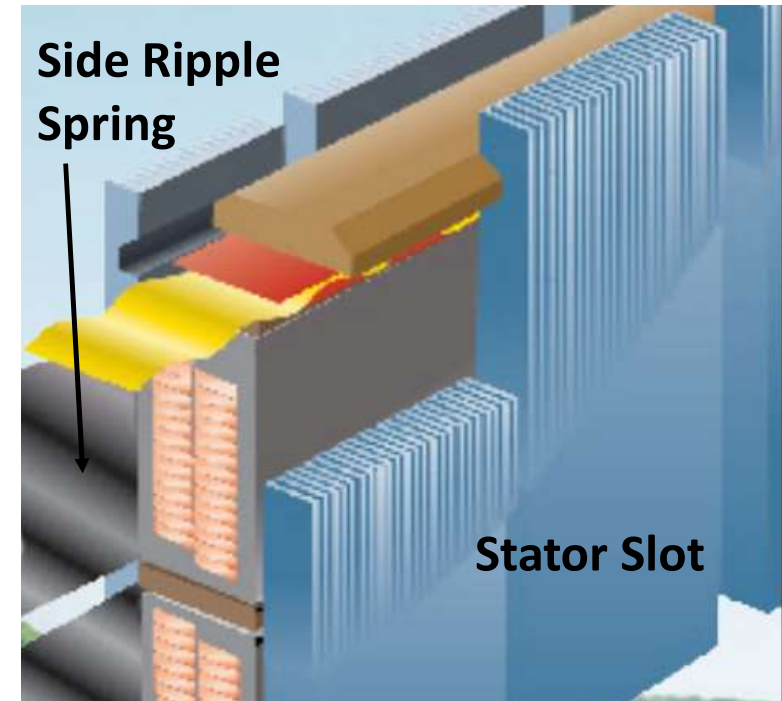
## 8. Slot Side Ripple Spring

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.)	Requirement p.a. (Rs Lac )		
Slot Side Ripple Spring (from Krempel, Germany)	As slot side packing between the stator bars and the slot sides in large capacity TG, to suppress bar vibrations.	TG60032	HEEP HARIDWAR	Kg	1000	180	85469090	Siemens/GE-Alstom/L&T
Special Features of the job		<ul style="list-style-type: none"> <li>It is made of glass fabric (with an adhesive base coat suitable for epoxy resin) and epoxy resin (with limiting temp. of above 155°C) with conducting pigment and has outer layers of polyester fleece. The material has ripple which runs at 45° w.r.t the cut edges.</li> <li>Thickness: 0.8±0.15 &amp; 1.0±0.2 mm &amp; Size: 460 X 1030mm</li> </ul>						
SN	Requirements of the job					Facility /Technology		Whether available in India (Yes / No )
1.	*Glass Transition Temp of Min.160°C * Resistance/unit length (Average) : Min.10kOhm/dm2. *Spring pressure (0.8/1.0mm Spring) @Spring Height 2.1mm = Min.2.2/4.5N/mm2 and @Spring Height 1.5 mm = Min.2.5/6 N/mm2. * Flattening strength must be lower than CBS. *When kept in flattened condition at 100°C/7days, maximum decrease in spring travel should be 30% and must not show any deformation or crack after completing the test					BHEL internal lab evaluation process		NO

## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/ development category	Status of indigenization
1 ( 1 Indian value addition supplier available)	0	<p>No vendor has shown interest so far. Although similar material sample received from Sahney Kirkwood is under evaluation as top ripple spring.</p> <p>Presently being procured from Krempel, Germany/ Beico, India</p>

## Slot Side Ripple Spring



Application in Generator Winding bar assembly



## 9. Support Ring /Support Cone

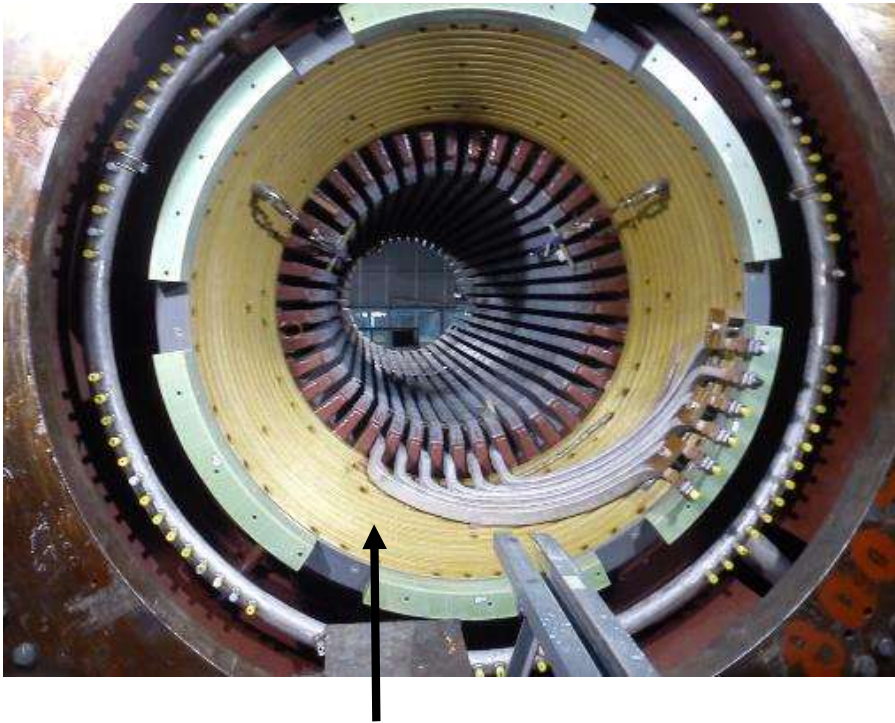
BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.)	Requirement p.a. (Rs Lac)		
Support Ring - Roechling (Germany), Kompozity (Poland), PCT (USA)	For support and consolidation of the overhang structure of large size TG (above 500 MW ratings).	TG60022	HEEP HARIDWAR	No.	16	500	98010013	Siemens/GE-Alstom/L&T
Special Features of the job		<ul style="list-style-type: none"> <li>It is a conical shape component made by using glass roving (of Al. Boro Silicate Glass 'E-glass') with suitable coupling agent and Epoxide resin system (OT of Min.150°C) hardened by heat manufactured by filament winding technique.</li> </ul>						
SN	Requirements of the job				Facility /Technology		Whether available in India (Yes / No)	
1.	*Glass Transition Temp of Min.160°C * CBS of Min.700N/mm <sup>2</sup> . *Compression (Parallel & Perpendicular): Min.500 /110 N/mm <sup>2</sup> . *Electrical Strength 1 minute proof (Parallel & Perpendicular): Min.25kV for 25mm gap /Min.15kV for 3mm gap.*Impact:Min.300kJ/m <sup>2</sup>				BHEL internal lab evaluation process		NO	

## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/ development category	Status of indigenization
0	1	<ul style="list-style-type: none"><li>• Development efforts with M/s Kineco, Goa are underway.</li><li>• Presently being procured from PCT USA, Kompozty Poland, Roechling Germany.</li></ul>



## Support Ring



**For support and consolidation of the overhang structure of large size TG (above 500 MW ratings).**





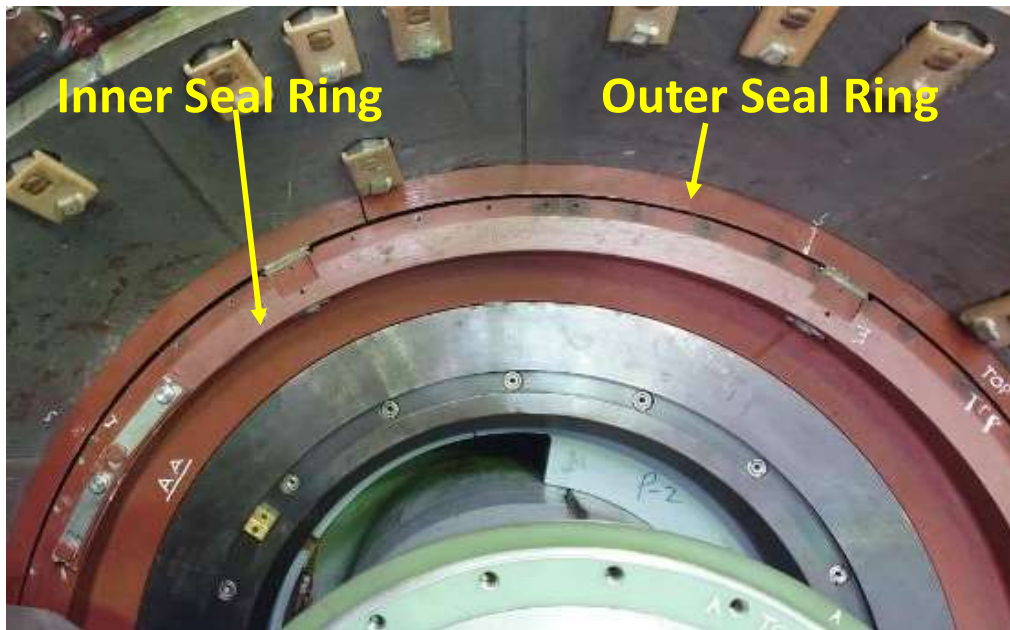
## 10. Seal Ring

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.)	Requirement p.a. (Rs Lac )		
Seal Ring - Roechling (Germany), Kompozity (Poland), PCT (USA)	Used during generator assembly, to seal the air gap between Rotor and Stator for guidance of hydrogen movement.	TG60022	HEEP HARIDWAR	No.	16	30	98010013	Siemens/ GE-Alstom/L&T
Special Features of the job		<ul style="list-style-type: none"> <li>These are components manufactured by using glass roving (of Al. Boro Silicate Glass 'E-glass') with suitable coupling agent and Epoxide resin system (OT of Min.150°C) hardened by heat manufactured by filament winding technique. Two rings are procured (a)Outer Ring (in three parts) and (b) Inner Ring( in two parts).</li> </ul>						
SN	Requirements of the job				Facility /Technology		Whether available in India (Yes / No )	
1.	*Glass Transition Temp of Min.160°C * CBS of Min.700N/mm2. *Compression (parallel & perpendicular): Min.500 /110 N/mm2.*Electrical Strength 1 minute proof parallel & perpendicular): Min.25kV for 25mm gap /Min.15kV for 3mm gap.*Impact:Min.300kJ/m2				BHEL internal lab evaluation process		NO	

## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/ development category	Status of indigenization
0	2	<ul style="list-style-type: none"><li>• Development enquiry raised on M/s Kineco, Goa .</li><li>• Development P.O. placed on M/s Texplas, Haridwar, supply received. Under trial.</li><li>• Presently being procured from PCT USA, Kompozty Poland, Roechling Germany.</li></ul>

## Seal Ring



Used during Generator Assembly

Inner Seal Ring  
(~ $\Phi 1.5\text{m}$ )



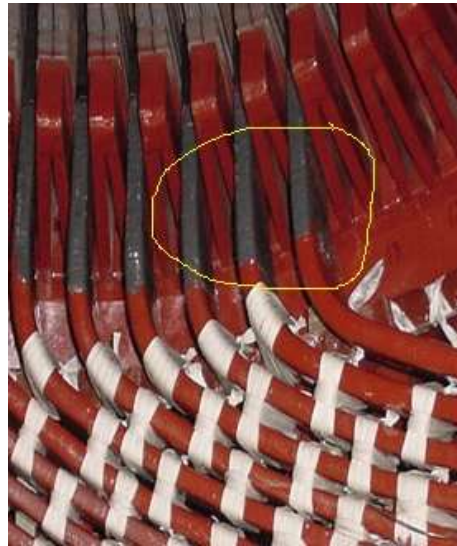
## 11. Resin and Curing Agent (Polyester Resin and Poly Iso-Cyanate Hardener)

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.)	Requirement p.a. (Rs Lac )		
Polyester Resin and Poly Iso-Cyanate Hardener	This resin-hardener mixture is required for Protective coating of End corona protection in resin poor, VPI winding stator bars and coils and for making putty with mica powder.	Polyester Resin (BHEL Haridwar specification HW29946 ) & Poly Iso-cyanate Hardener (BHEL Haridwar specification HW29978 )	HEEP Haridwar	LTR	1400	18	39100000	Siemens/ GE-Alstom/L&T
Special Features of the job		<ul style="list-style-type: none"> <li>Polyester Resin and Poly-Isocyanate Hardener, which are used in combination, for application by brush, on the overhang of stator winding bars of Turbo Generators to provide an elastic, uniform and high glossy protection layer.</li> <li>Shelf life of material should be 6 months minimum.</li> </ul>						
Sl.	Requirements of the job				Facility /Technology		Whether available in India (Yes / No )	
1.	These materials are very critical, as these are to be used on critical ECP paint as covering / protection layer on winding bars, on which life and performance of BHEL Generators will depend.				BHEL Internal evaluation		No.	

## Efforts & Status of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/ development category	Status of indigenization
0	2	<ul style="list-style-type: none"><li>• M/s Fine Finish, India will submit development samples for laboratory evaluation.</li><li>• M/s Elantas Beck India has submitted development samples for laboratory evaluation.</li><li>• Presently being procured from M/s Axalta Coating systems, Germany through authorized Indian distributor Diksha Enterprises Bhopal.</li></ul>

## Resin and Curing Agent Polyester Resin and Poly Iso-Cyanate Hardener



Coated Bars in Stator



End Corona  
Coating section of  
bar



Coated Bus Bars in  
Support ring



## 12. INSULATING RED ENAMEL PAINT

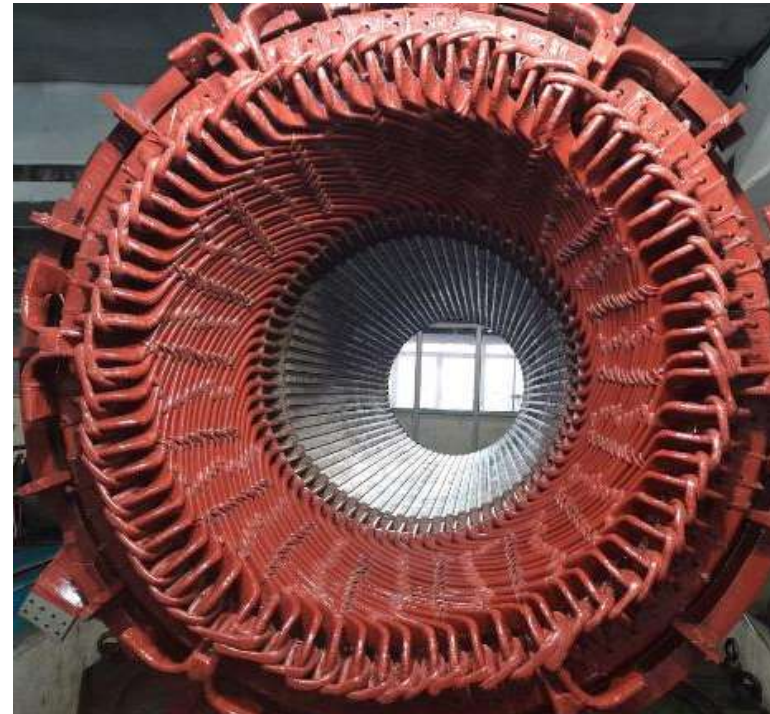
BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.)	Requirement p.a. (Rs Lac )		
Insulating Red Enamel Paint	This material is used as a surface coating for improved appearance, protection of coils and parts of electrical machines against water, tropical climate conditions and to ensure high tracking resistance.	BHEL Haridwar specification TG60140 Von Roll Switzerland grade DEMICOAT 2404	HEEP Haridwar	LTR	170	4.0	3208	Siemens/ GE-Alstom/L&T/ ABB
Special Features of the job		<ul style="list-style-type: none"> <li>It is an air drying insulating enamel of thermal class of 130°C consisting of synthetic resin as binding agent, solvents and pigment.</li> <li>Shelf life of material should be 12 months minimum.</li> </ul>						
Sl.	Requirements of the job			Facility /Technology		Whether available in India (Yes / No )		
1.	The material is very critical intended to be used for anti-tracking application up to rated voltages of 21 kV (test voltage up to 63 kV).			BHEL Internal evaluation		No.		

## Efforts & Status Of Indigenization

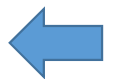
Number of indigenous vendors under approved category	Number of indigenous vendor under trial/ development category	Status of indigenization
0	2	<ul style="list-style-type: none"><li>• Improved developmental sample from M/s Fine Finish, India is expected.</li><li>• Developmental enquiry to M/s Chetak Manufacturing company, India has issued.</li><li>• Presently being procured from M/s Vonroll, France.</li></ul>



## INSULATING RED ENAMEL PAINT



Overhang Painted section of stator



### 13. Conducting varnish (Low Ohmic grade)

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement t p.a. (Qty.)	Requirement p.a. (Rs Lac )		
Conducting Varnish (Low Ohmic Grade)	This material is used for slot/ outer corona protection on the surface of stator bars of VPI design generators.  The varnish is applied with brush on the insulation surface	BHEL Haridwar specification HW27870  Von Roll Switzerland grade 8003	HEEP Haridwar	Kg	480	22.0	3814	Siemens/ GE-Alstom/L&T/ ABB
Special Features of the job		<ul style="list-style-type: none"> <li>It consists of alkyd resin as binding agent, solvents and graphite powder.</li> <li>Shelf life of material should be 12 months minimum.</li> </ul>						
Sl.	Requirements of the job				Facility /Technology		Whether available in India (Yes / No )	
1.	The material is very critical intended to be used for slot corona protection over main wall insulation, up to rated voltages of 27 kV (test voltage up to 81 kV).				BHEL Internal evaluation		No.	

samvaad@bhel.in

## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/development category	Status of indigenization
0	2	<ul style="list-style-type: none"><li>• Sample from M/s Isovolta India testing ok in CPL. However not found OK in ageing study. Improved sample will be asked.</li><li>• Developmental sample from M/s Fine Finish, India is awaited.</li><li>• Presently being procured from M/s Vonroll, France.</li></ul>

## Conducting varnish (Low Ohmic grade)



Stator bar coated with OCP Varnish



## 14. Semi Conducting varnish

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.)	Requirement p.a. (Rs Lac )		
Semi Conducting Varnish	This material is used for end corona protection (ECP) on the overhang-first bend region of stator bars of VPI design generators. The varnish is applied with brush on the insulation surface.	BHEL Haridwar specification HW27869 Von Roll Switzerland grade 8001	HEEP Haridwar	Kg	180	12.0	3814	BHEL Unit – Bhopal Siemens/ GE-Alstom/L&T/ ABB
Special Features of the job		<ul style="list-style-type: none"> <li>It consists of modified phenolic resin as binding agent, solvents and silicon carbide powder.</li> <li>Shelf life of material should be 12 months minimum.</li> </ul>						
Sl.	Requirements of the job				Facility /Technology		Whether available in India (Yes / No )	
1.	The material is very critical intended to be used for ECP protection system, up to rated voltages of 21 kV (test voltage up to 63 kV).				BHEL Internal evaluation		No.	

## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/development category	Status of indigenization
0	2	<ul style="list-style-type: none"><li>• Improved sample to be asked from M/s Isovolta India.</li><li>• Developmental sample from M/s Fine Finish, India is awaited.</li><li>• Presently being procured from M/s Vonroll, France.</li></ul>

## Semi Conducting Varnish



Stator bar coated with ECP Varnish  
at first bend



## 15. Magnetic Steel Sheet Varnish

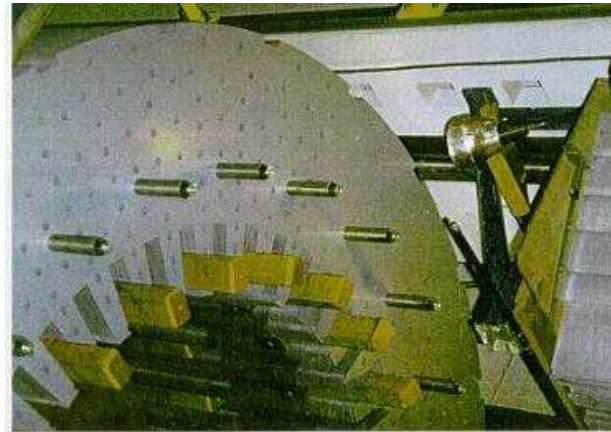
BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.)	Requirement p.a. (Rs Lac )		
Magnetic Steel Sheet Varnish	The magnetic steel sheet varnish is used for insulation of cold and hot rolled magnetic steel sheets of stator core. The binder of varnish should be phenolic/melamine resin base.	BHEL Haridwar specification AA27541	HEEP Haridwar	LTR	4000	32	3814	Siemens/ GE-Alstom/L&T/ ABB
Special Features of the job		<ul style="list-style-type: none"> <li>This varnish is a pigmented, water thinnable and hot curing synthetic resin varnish (phenolic/melamine resin base).</li> <li>The cured varnish is suitable for temperature endurance stability of 180°C and for short periods at 220°C.</li> <li>Shelf life of material should be 12 months minimum.</li> </ul>						
Sl.	Requirements of the job				Facility /Technology		Whether available in India (Yes / No )	
1.	This is a 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.				BHEL Internal evaluation		No.	



## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/development category	Status of indigenization
0	3	<ul style="list-style-type: none"><li>• Development sample from M/s Dev Coatings and Catalyst, India found O.k. in laboratory testing. Further sample asked for shop trial.</li><li>• Development sample from M/s Chetak Industries, India not found O.k.</li><li>• Development sample from M/s Electrocoating Insulation, India not found O.k.</li><li>• Presently being procured from M/s Rembrandtin, Austria and M/s Axatla Coating systems, Germany</li></ul>

## Magnetic Steel Sheet Varnish



Punching coated with Varnish



## 16. Silicone Resin compound and Silicone Rubber hardener

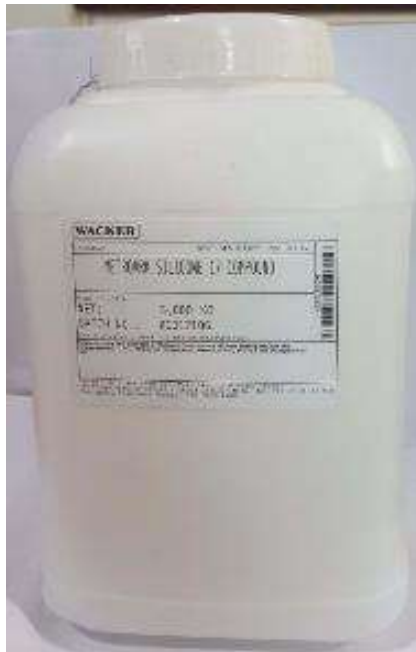
BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.)	Requirement p.a. (Rs Lac )		
Silicone Resin compound and Silicone Rubber hardener	This resin-hardener mixture is required for preparation of sealing/filling compound for electrical machines.	BHEL Haridwar specifications TG60219 & TG60217	HEEP Haridwar	Kg	16	2	3403	Siemens/ GE-Alstom/L&T/ ABB
Special Features of the job		<ul style="list-style-type: none"> <li>Shelf life of material should be 12 months minimum.</li> </ul>						
Sl.	Requirements of the job				Facility /Technology		Whether available in India (Yes / No )	
1.	This resin-hardener mixture gives an elastic rubber like compound with gives sealing as well as damping properties.				BHEL Internal evaluation		No.	

samvaad@bhel.in

## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/development category	Status of indigenization
0	0	<ul style="list-style-type: none"><li>• Presently Wacker, USA material is being procured through Indian Authorized distributors (M/s Savisyl Kolkata, M/s Global Trader Delhi)</li></ul>

## Silicone Resin compound and Silicone Rubber hardener



## 17. Silicone Resin compound and Catalyst

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.)	Requirement p.a. (Rs Lac )		
Silicone Resin compound and Catalyst	This resin-hardener mixture is required for preparation of silicone putty to be used as filling compound for electrical machines.	BHEL Haridwar specifications HW29974 & HW29973	HEEP Haridwar	KG	500	10	39100000	Siemens/ GE-Alstom/L&T/ ABB
Special Features of the job		<ul style="list-style-type: none"> <li>Shelf life of material should be 12 months minimum.</li> </ul>						
Sl.	Requirements of the job				Facility /Technology		Whether available in India (Yes / No )	
1.	This resin-hardener mixture gives an elastic rubber like compound with gives sealing as well as damping properties.				BHEL Internal evaluation		No.	

samvaad@bhel.in

## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/development category	Status of indigenization
0	1	<ul style="list-style-type: none"><li>• Sample received from M/s 3A Associate, India is found O.K. in laboratory testing. Vendor has applied for registration at BHEL Haridwar.</li><li>• Presently Wacker, USA material is being procured through Indian Authorized distributors (M/s Savisyl Kolkata, M/s Global Trader Delhi)</li></ul>

## Silicone Resin compound and Catalyst





## 18. Silicone Carbide Powder

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.)	Requirement p.a. (Rs Lac )		
Silicone Carbide Powder	This material is used as filler for semiconducting varnish in END CORONA PROTECTION on VPI bars and connecting bus bars. This varnish is applied with brush on the insulation surface	BHEL Haridwar specification TG60451	HEEP Haridwar	Kg	72	12	2849	Siemens/ GE-Alstom/L&T/ ABB
Special Features of the job		<ul style="list-style-type: none"> <li>This grain size of filler(powder) is of utmost importance for achieving desired results.</li> <li>Shelf life of material should be 12 months minimum.</li> </ul>						
Sl.	Requirements of the job				Facility /Technology		Whether available in India (Yes / No )	
1.	The material is very critical intended to be used for critical ECP protection up to rated voltages of 27 kV (test voltage up to 63 kV).				BHEL Internal evaluation		No.	

## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/ development category	Status of indigenization
0	0	<ul style="list-style-type: none"><li>• No vendor has shown interest so far.</li><li>• Presently being procured from M/s Esk Germany.</li></ul>

## Silicone Carbide Powder



End Corona  
Coating section of  
bar



## 19. Chalk Powder and Calcite Powder

BHEL							HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	UOM	Requirement p.a. (Qty.)	Requirement t p.a. (Rs Lac )		
Chalk Powder Calcite Powder	These are used in Resin-Hardener mixture in various compositions for making epoxy putty filling compound in overhang windings of Turbo-Generators.	BHEL Haridwar specifications HW22292 : Chalk Powder – Special Violet Label – OM' Grade of M/s Omya, France  HW22293 : Calcite Powder Omya BL OG' Grade of M/s Omya, France	HEEP Haridwar	Kg	5000	4	2509	Siemens/ GE-Alstom/L&T/ ABB
Special Features of the job		*Calcite Powder is consisting of Calcium carbonate (~ 98.9%). Particle size Average cut: ~4 microns, where more than 40 microns is ~0.1%. Moisture content ~0.2%. *Special chalk powder is consisting of Calcium carbonate (~ 98.5%). Particle size Average cut: ~2.5 microns, where more than 40 microns is ~0.2% and less than 2 microns is ~40%.						
Sl.	Requirements of the job			Facility /Technology		Whether available in India (Yes / No )		
1.	These Powders are mainly made up of Calcium Carbonate in purest form without magnetic impurity.			BHEL Internal evaluation		No.		

samvaad@bhel.in

## Efforts & Status Of Indigenization

Number of indigenous vendors under approved category	Number of indigenous vendor under trial/development category	Status of indigenization
0	0	<ul style="list-style-type: none"><li>• No vendor has so far shown interest.</li><li>• Presently being procured from M/s Omya, France through their Indian office Omya India.</li></ul>

## Chalk Powder and Calcite Powder





**THANKS**