www.yashhv.com

YASH HIGHVOLTAGE

Retrofit Solutions

FOR TRANSFORMER BUSHINGS

Rated Voltage : 24 kV ~ 245 kV

Rated Current : 400 A ~ 25000 A

Insulation : Oil - Impregnated Paper (OIP), Resin Impregnated Paper (RIP), Resin Impregnated Synthetic (RIS)

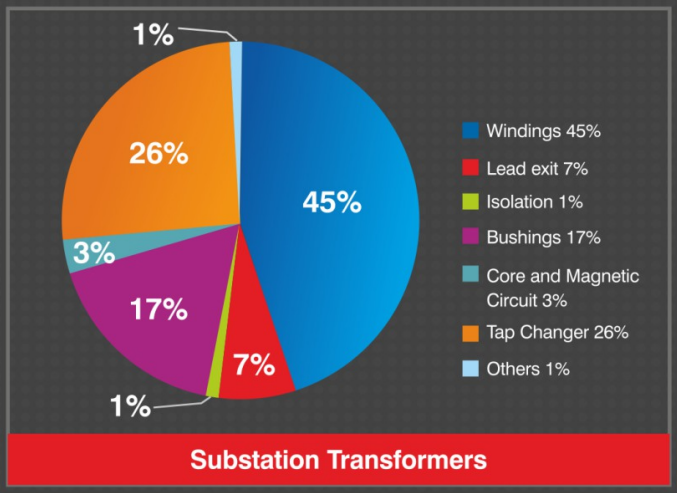
Application : Transformer - Outdoor

Type : OIP to OIP / OIP to RIP / OIP to RIS / RIP to RIP / RIP to RIS / RIS to RIS

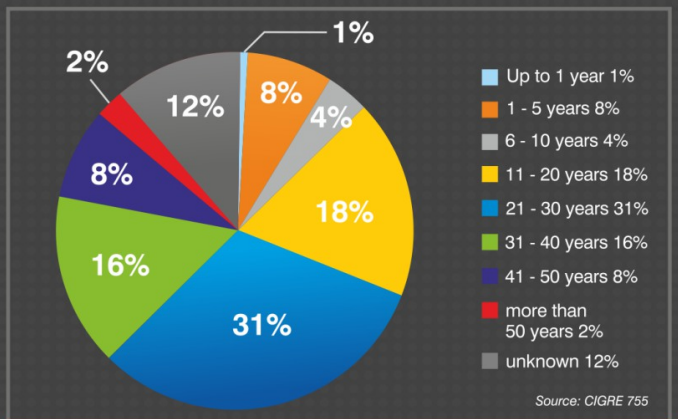
Insulator : Porcelain / Hollow Composite Silicone

Standard : IEC 60137:2017 / IEEE / Any Other eqv.

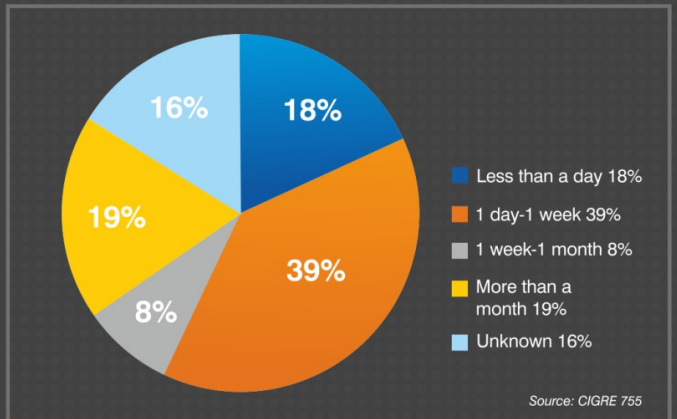
Bushing failures constitute the third largest cause of transformer failures globally i.e approx. 17%. The contribution of transformer damage due to bushing failures is even higher in India (30-35%), according to the latest failures statistics.



Substation Transformers



Years in Service prior to Failure



Transformer Outrage Duration

Table 1. Significance of condenser bushing tan δ and capacitance test values - analysis and interpretation of results [5, 8]

Tan δ and capacitance - trend of test results	Analysis
Increase in tan δ (between 0.7% and 1%) accompanied by marked increase of capacitance	Points to excessive moisture in the insulation
Very high increase in tan δ alone (over 1%)	Points to thermal deterioration, aging or contamination other than the moisture
Low tan δ	Points to weak potential connections
Increased capacitance	Points to possible short-circuited condenser layers
Decreased capacitance	Points to possible floating ground sleeve, or open or poor test tap connection
Very large variation in tan δ and capacitance values	Points to no oil in the bushing
Negative tan δ accompanied with small reduction in capacitance	May result from external surface leakages or internal leakages resulting from carbon tracking, etc.

Source: Transformers Magazine / Special Edition / Bushings, 2017

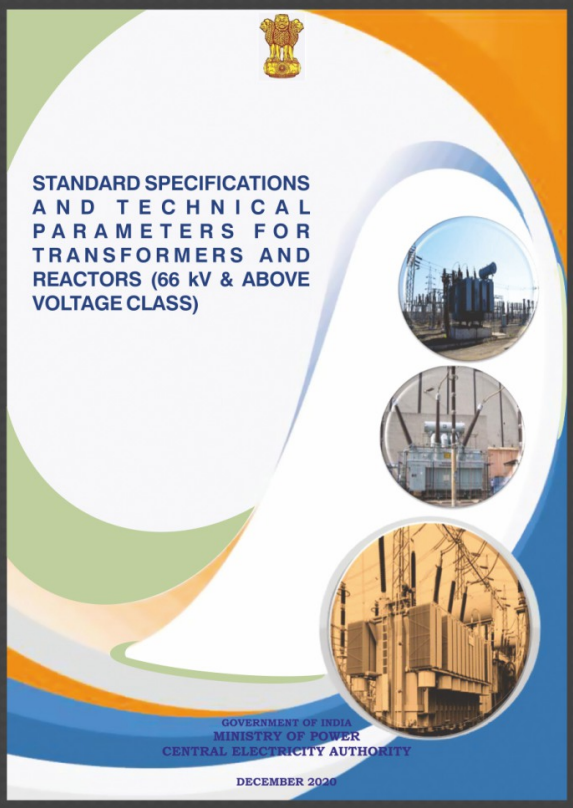
Some key root causes for bushing failures

- Lack of timely condition monitoring
- Ageing fleet of OIP bushings operational for >15 years and not replaced with suitable spares on-time
- Aged Oil type / Oil filled bushings population is high (>90%) in the country's transmission network

While bushings make only 2-3% of the transformer cost, failure arising out of bushings often are followed by explosion, tank rupture, hazardous fire and colossal damage.

The unique offerings of YASH which enable RETROFITTING/ REPLACEMENT of OIP bushings with the interchangeable RIP/RIS bushings, provide utilities with unique ability to secure their existing transformer fleet and implement state-of-the-art, safe and dry type bushing technology retrofitted to their needs.

torrent POWER | NTPC-SAIL Power Company Limited (A Joint Venture of NTPC & SAIL) | POWERICA A PROMISE FOR POWER | CENAL | Bhushan POWER & STEEL | JINDAL STEEL & POWER



Extract from CEA's latest Standard Specification for Power Transformers, Page II-27

During the discussion in Standing Committee meetings relating to failure of sub-station equipment, it has been observed that bushing is one of the major cause of failure of transformer. In many cases this has led to severe consequences like fire/burning of transformer/reactors and explosion. **Hence RIP/RIS bushings** have been specified at various voltage levels in place of conventional **OIP bushings. RIS would have been a better/preferred alternative to OIP, but due to limited manufacturers in the world, both RIP & RIS options have been considered.**

BUSHINGS

For various voltage class of transformer / reactor, type of bushings shall be as follows :

Voltage Rating	Bushing Type
145 kV, 245 kV and 420 kV bushings for 400 kV and below voltage class transformers and reactors	RIP / RIS
420 kV and 800 kV bushings for 765 kV Class transformers; 800 kV bushings in 765 kV Class reactor	OIP / RIP / RIS
Bushings of 36 kV and below	Solid porcelain or oil communication type OIP (For high current requirement e.g. for GTs)
Bushings of other rating	OIP / RIP / RIS

Taking cognizance of the criticality of bushings in a transformer, premiere policy makers of the nation as well as other national and domestic utilities have progressively adopted specifications for transformers and reactors with the use of safe and reliable RIP/RIS bushings for all new transformers. Many utilities are also actively replacing their existing OIP bushing fleet with retrofitted RIP/RIS bushings on the old transformers.

YASH offers a series of Comprehensive solutions in the field of Transformer Bushings as below:

1. **Comprehensive Bushing Retrofit Solutions** - One to one replacement of old bushings with the new OIP bushings and also with the latest dry type RIP/RIS bushings i.e OIP to OIP, OIP to RIP, and OIP to **RIS Bushings**
2. **On-site/Off-site Bushing Technical Testing & Analysis Services**
3. **On-site/Off-site Bushing Repairing Services for OIP as well as RIP/RIS bushings, including shed repair of RIP/RIS bushings**

RIP Bushing installed on a transformer as a replacement to existing OIP bushing in Y phase with R&B phase operating with the old OIP bushings.

Comprehensive Bushing Retrofit Solutions

for a long transformer service life

Replacing bushings on a transformer is extremely crucial since faulty bushings can lead to substantial damage to the transformer and the immediate vicinity.

At YASH, we have proven our ability to be a large-scale supplier of standard design IEC / IEEE bushings. We have also gone beyond to become a comprehensive solution provider for highly sought after repairs/replacements and retrofit solutions to old/existing transformer bushings of any reputed global make, which may have developed deficiencies/damage over years of service or have been damaged during transportation/handling/ commissioning or long-term storage at the site.

Globally, there are numerous solution providers for Power Transformer repairs and overhauling, but YASH remains unrivalled in providing retrofit/repair solutions specific to transformer bushings, and this capability is well appreciated and welcomed by global Utilities/Power Substations/EPCs and transformer repairing/overhauling enterprises.

We can easily achieve this through a team of dedicated and experienced Service and Retrofit Engineers, leaving nothing to chance right from the site visit and evaluation of the existing products, study of old drawings and offering ditto interchangeable solutions as well as working closely with the customer to identify interchangeability needs.

Salient Features:

- **"INTERCHANGEABLE SOLUTIONS POSSIBLE FOR OIP TO OIP, OIP TO RIP (RESIN IMPREGNATED PAPER) BUSHINGS AND OIP TO RIS (RESIN IMPREGNATED SYNTHETIC) BUSHINGS!" - Giving a unique opportunity for discerning End users and Transmission utilities to take advantage of the latest dry type bushing technologies of RIP/RIS, to exchange with existing OIP bushings installed on transformer at the site, thereby offering the unique advantages of highly safe and reliable dry type bushings on the existing transformer.**
- Excellent customization/retrofit potential
- Ability to interchange, to a large extent in terms of Mounting, BCT, Oil end length, Creepage, Terminations amongst other things
- Whether the requirement is to procure few or many bushings, we deliver
- Swift development times for non-standard designs and parts
- Highly competitive solutions
- Ability to visit the site for physical evaluation and measurements, if drawings not available
- Engineering consultation with customer's technical team, to arrive at interchangeable options
- Full standard warranty offered on bushings supplied as retrofit to existing bushing.

Our core focus on transformer bushings and extensive experience has powered us with the ability to offer flexible and highly customizable retrofit bushing solutions.

24 kV 4000 A, 5000 A, 7500 A TELK design retrofit - Developed & Supplied to various NTPC sites through reputed Transformers manufacturers such as ABB & EMCO Limited

24 kV 4500 A - Developed & Supplied to NTPC Kawas through EMCO Limited

24 kV 5500 A Retrofit Solution - Developed & Supplied to various customers including Torrent Power (a prominent private Utility in West India) & NPCIL (Nuclear Power Corporation of India Limited

MAHAGENCO
Maharashtra State Power Generation Co. Ltd.

MAHATRANSCO
Maharashtra State Electricity Transmission Co. Ltd.

145 kV OIP bushing as Retrofit to old 145 kV SRBP Bushing at MPPTCL Khandwa

145 kV RIS bushing as Retrofit to old 145 kV OIP Bushing at CESC

52 kV OIP bushing as Retrofit to damaged OIP Bushing at MPPTCL

145 kV OIP bushing as Retrofit to damaged OIP Bushing at Hindalco

145 kV 800 A 600 CT RIS bushing as Retrofit to old 145 kV OIP Bushing at CESC (a prominent private Utility in Eastern India)

24 kV 10000 A BHEL design retrofit solution

24 kV 12500 A 0 CT HC Bushing - Developed for GSECL

36 kV 16000 A 0 CT - Developed for NSPCL

36 kV 16000 A Retrofit Solution - Developed for CENAL Turkey

36 kV 10000 A HC bushing - Developed for Export customer in Ecuador

36 kV 16000 A Special Copper Design bushing - Developed & Supplied to NTPC Singrauli through ALSTOM

CESC LIMITED

NPCIL

BPC

KARNATAKA POWER CORPORATION LTD

GETCO

UPRVUNL

On-site / Off-site Bushing Technical Testing & Analysis Services

Through our dedicated Services team, we offer on-site **"Capacitance and Tan Delta"** test services for Transformer Bushings for the purpose of condition monitoring and early fault detection, with help of state-of-the-art portable test kit. Given our expertise as a dedicated manufacturer of Transformer Bushings for over 20 years, our team of engineers possess the ability not only to test/assess the bushing, but also to add immense value in providing on the spot

recommendations for line of action as regarding the correction or solution of the issue detected, if any. These services are available for Transformer Bushings of any global reputed make.

We also make our comprehensive in-house test laboratories available to customers who seek a complete routine testing/technical evaluation of any existing bushing to determine its health.

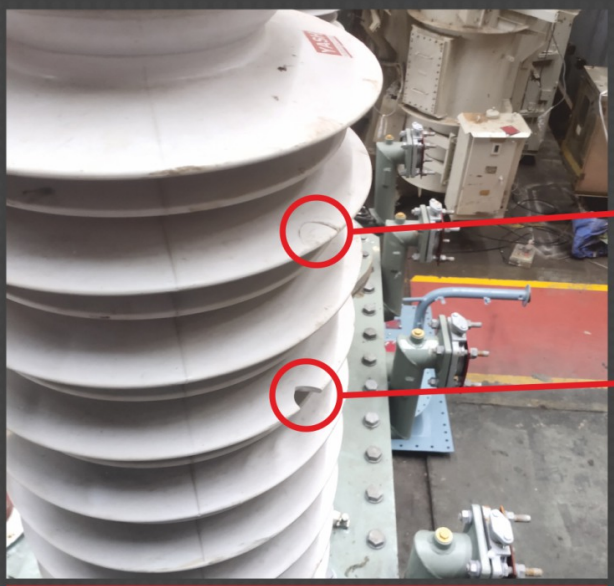
On-site / Off-site Bushing Repairing Services

Transformer Bushings, especially ones having porcelain insulators are critical components that require utmost care in handling, transportation, storage, erection and overall also during maintenance/routine operation. We come across several situations wherein bushings get damaged due to various causes. Through our services team, we offer specialized bushing repair solutions that include but are not limited to

- Porcelain replacement
- Complete overhauling of bushing
- Silicone Insulator shed repair
- Part replacements

And many more…

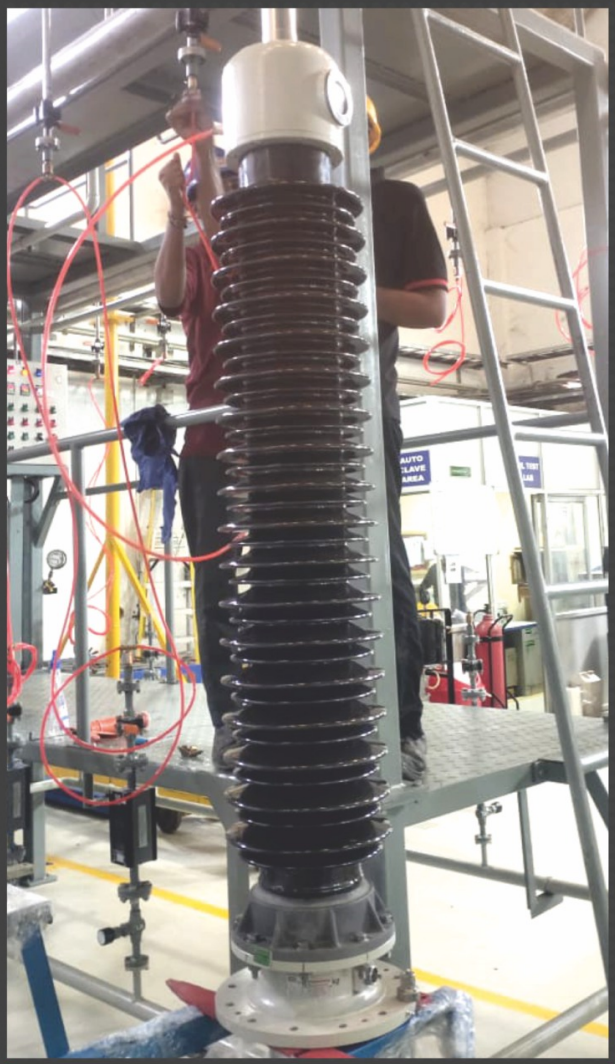
On-site Bushing repairing being carried out



Damaged Silicone sheds at site

Repaired Silicone sheds on-site

145 kV OIP bushing with transit damage to Air end porcelain



Porcelain part replacement, Bushing refurbished and supplied after complete routine testing

Product Range

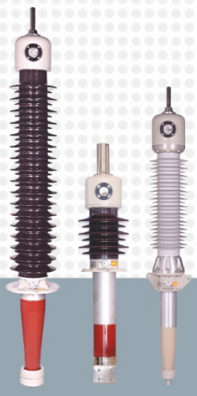
HIGH CURRENT BUSHINGS

Rated Voltage
24 kV ~ 36 kV

Rated Current
4000 ~ 20000 A

Standard
IEC-60137:2017 / IEEE

Types
Oil filled / Communicating / OIP Condenser



OIP CONDENSER BUSHINGS

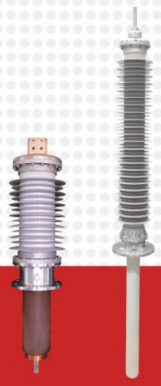
Rated Voltage
24 kV ~ 170 kV

Rated Current
Upto 4000 A

Standards
IEC-60137:2017/ ANSI/IEEE

Connection
Draw Lead / Draw Rod / Stem type

Housing
Porcelain / Composite



RIP/RIS CONDENSER BUSHINGS

Rated Voltage
24 kV ~ 245 kV

Rated Current
400 A ~ 6300 A*

Standard
IEC-60137:2017

Connection
Draw Lead / Draw Rod / Stem type

Housing
Composite / Silicone Rubber

***6300** and other special current ratings also available on request

Technology Collaboration

OIP WALL BUSHINGS -OIL TO OIL BUSHINGS

Rated Voltage
24 kV ~ 170 kV

Rated Current
400 A ~ 3150 A*

Standard
IEC-60137:2017 OR IEEE C.57.19.00 / 01

Connection
Draw Lead / Draw Rod / Solid Conductor

Housing **Porcelain / Composite Silicone Polymer**

*Customized Rated Current >3150A are available upon request

YASH HIGHVOLTAGE

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Represented By

Tiger