



Transformer bushings market trends

Global market development

1. Introduction

We estimate that the global market for transformer bushings was worth a little under US\$1.4 billion in 2016. The market is estimated to grow at an overall rate of 5.5 % CAGR through to 2026, by which time it will be worth US\$2.4 billion at 2016 dollar values. These estimates include all types of bushings used in the production and operation of power and distribution transformers; from very simple primary solid or bulk bushings on pole top distribution transformers through to the extremely complex power transformer primary bushings that may operate at voltages in excess of 1 MV.

The market development by geographical region is shown in Table 1.

The global market is dominated by Asia with a 48 % share of the market in 2016, rising to a 54 % share in 2026. Before delving deeper into this data set, it is important to provide a little detail on the methodology and definitions of this market segment. The market for transformer bushings comprises two elements; new

products supplied for new transformers, and replacement bushings sold either to upgrade an existing installation or as a replacement for a bushing that has suffered damage during the working life of the transformer.

The new bushings for new transformers are generally purchased by the transformer manufacturer for delivery to the place of manufacture, no matter where the transformer will ultimately be installed. A transformer ordered by a utility company in Country A from a transformer manufacturer based in Country B may rightly be considered a part of the transformer market in Country A; whereas the bushings for that transformer are considered to be a part of the bushings market in Country B. Replacement bushings are generally ordered by, and are for delivery to, the transformer owner where the unit is operating.

The market for new bushings in any given country is therefore dependent on the transformer manufacturing base in that country, whereas the replacement market is dependent on the past and present transformer market in that country.

We estimate that the global market for transformer bushings was worth a little under US\$1.4 billion in 2016

Table 1. The global market for transformer bushings 2016 to 2026

Overall market \$ million	2016	2026	CAGR
Western Europe	216.6	348.8	4.88 %
Eastern Europe	39.8	54.8	3.26 %
Former Soviet Union	53.5	67	2.28 %
Africa	41.6	61.6	3.99 %
Middle East	55.3	71.7	2.64 %
Indian Subcontinent	60.8	112.9	6.39 %
Asia	659	1,264.80	6.74 %
South & Central America	65.6	95.3	3.80 %
North America	177.3	262.9	4.02 %
Australasia	5.1	7.7	4.26 %
World total	1,374.60	2,347.60	5.50 %

For this reason, the Western European market for bushings is nearly 16 % of the global market whilst the transformer market is only 12 %; and similarly the North American bushings market is 13 % and the transformer market is 15 %; the Asian bushing market is 48 % and the transformer market is 46 % of the global total.

2. Power vs. distribution

There are a number of ways in which the bushings market can be segmented, including but not limited to:

- working voltage
- capacitance graded/non graded

- housing material and shed – ceramic vs. composite
- insulating methodology – OIP, RIP, RIS
- filling material – oil, gel, gas, etc.
- transformer function

The ratio of power transformer bushings to distribution transformer bushings varies from region to region. The variation is the result of the constitution of production base in each region, the age of transformers (and

hence bushings) in the fleet in each country and any utility organisation policy with regards to re-bushing of the fleet. The market can also be further subdivided into three generic types of transformers depending on their function within the electricity supply network. The first stage in the network is the function of stepping up the voltage level from the generator output levels to the level at which electricity is transmitted in the grid; typically these generator step-up (GSU)

The market is estimated to grow at an overall rate of 5.5 % CAGR through to 2026, by which time it will be worth US\$2.4 billion

Table 2. The global bushings market and transformer market 2016

2016 Statistics	% of global bushings market	% of global transformer market	% of bushings market that is replacement
Western Europe	15.80 %	12.10 %	7.00 %
Eastern Europe	2.90 %	2.40 %	9.90 %
Former Soviet Union	3.90 %	3.80 %	31.30 %
Africa	3.00 %	4.80 %	59.50 %
Middle East	4.00 %	5.20 %	22.30 %
Indian Subcontinent	4.40 %	4.50 %	1.60 %
Asia	47.90 %	46.40 %	2.70 %
South & Central America	4.80 %	4.90 %	38.90 %
North America	12.90 %	15.20 %	7.10 %
Australasia	0.40 %	0.80 %	17.60 %
World total	100 %	100 %	9.50 %

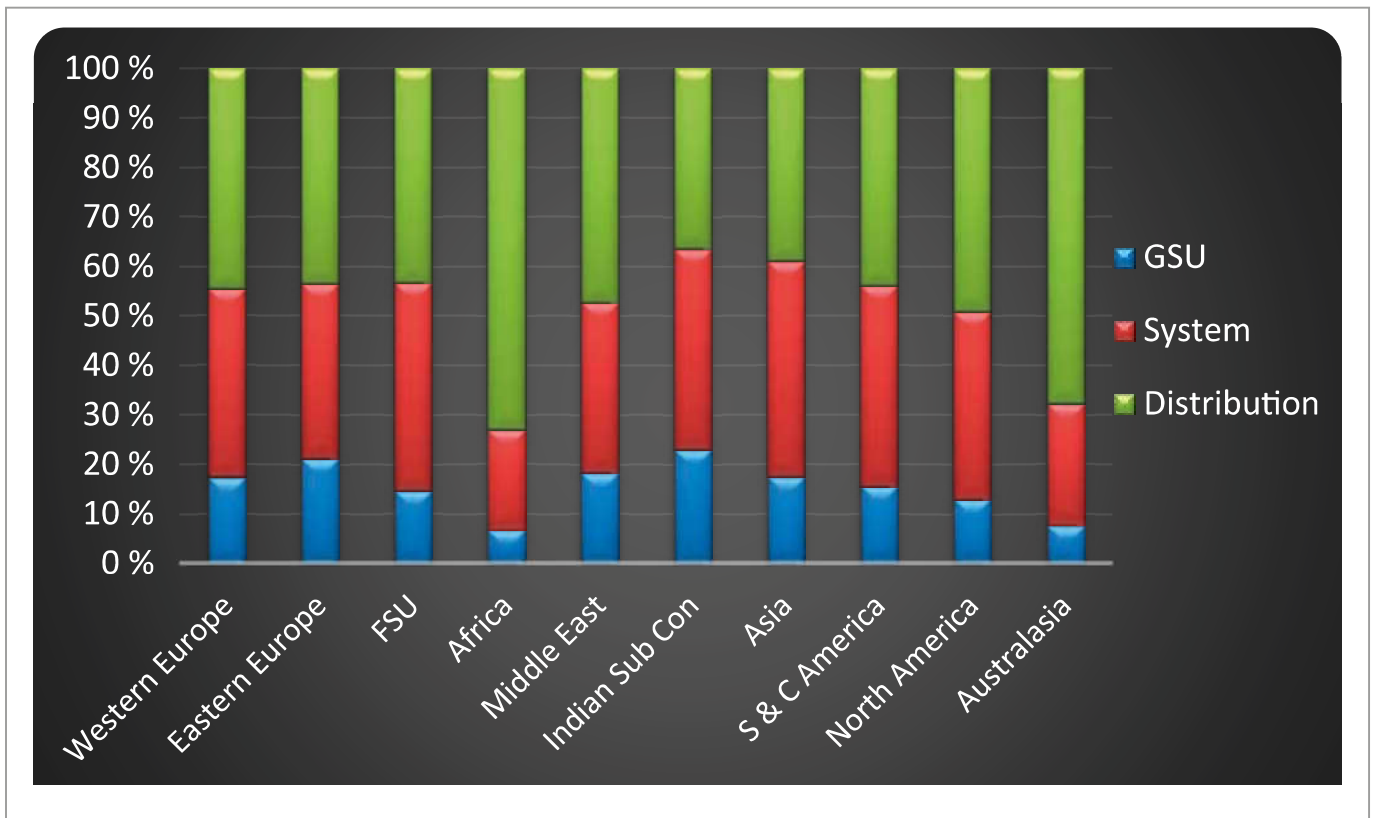


Figure 1. Transformer bushing market 2016 by transformer function

transformers increase voltage from less than 20 kV up to higher voltages in the order of 400 kV or higher.

The second stage incorporates many types of transformer products which are grouped under the heading of system transformers. These are used to transmit electricity throughout a country and eventually to step down to a voltage level that is appropriate prior to distribution throughout a town/city/village at distribution level. Typically these transformers will have primary voltage levels in the hundreds of kV and secondary levels less than 100 kV.

Finally, distribution transformers are used to further reduce the voltage to that used by end consumers. Sometimes this is achieved in one step, more often in two steps of primary and secondary distribution. Furthermore, in a complicated grid network multiple distribution transformers are utilised to ensure security of supply by differing supply route options within a conurbation.

The market for transformer bushings by type of transformer is illustrated in Figure 1.

Overall, the market composition varies only marginally by 2026. Over a ten year period it might be expected that any

There is greater dynamics in technology at higher voltage levels where bushings are critical components, while at lower voltage spectrum the bushings will be fitted for life

short term trends are smoothed out. Regional spending variations caused by reinforcing work of either the transmission or the distribution network do exist, but have only a marginal effect on the overall market. There are other drivers at work that impact positively and negatively on the power transformer bushings market. The ever continuing global trend to higher and higher voltage levels and more expensive bushings has a positive effect which is mostly counteracted by the depressing effects of less expensive manufacturing techniques and price competition in general as technology matures and the production base expands.

3. Technology trends

The first point to note is that transformers are usually designed with a working life of up to 30 years and it is not unusual to find units that are at least 40 years old still in service. This means that in any giv-

en country the transformer fleet could well have units that were built in the early 1970s still in service. It necessarily follows that these were built with the technology that existed at that time.

There will be greater dynamics at the higher end of the voltage range because bushings are a critical component that is monitored and if necessary upgraded as and when better technology comes along; however, at the lower end of the voltage spectrum the bushings will be fitted for life. This inevitably means that ceramic solid or bulk will still be in service at the lower end and resin bonded paper (RBP) bushings at the upper end will still be in service. Both technologies that remain virtually unchanged for a century.

4. Distribution transformer bushing trends

40 years ago distribution transformers will have had almost 100 % ceramic bush-

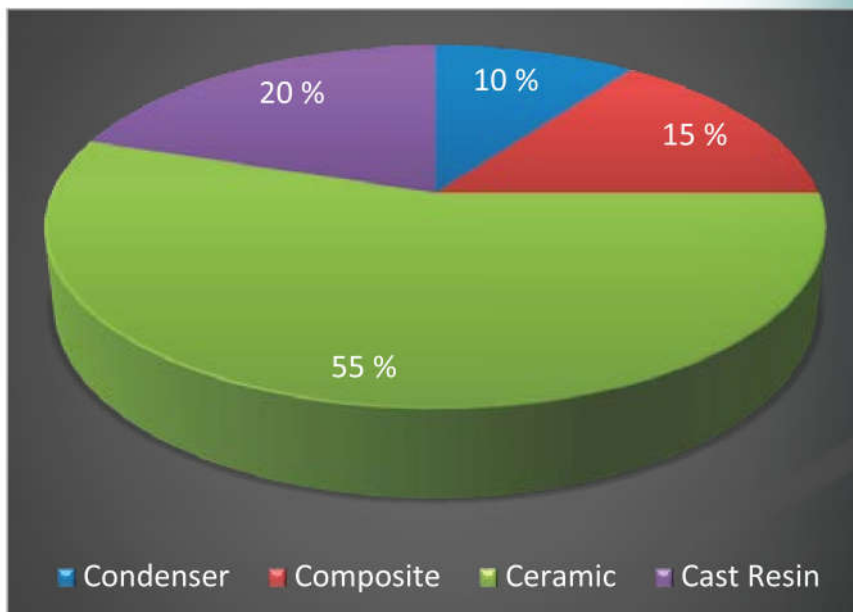


Figure 2. Distribution transformer bushings by type 2016



The market share of composite technology in bushings is likely to mirror that experienced in other insulator markets 0 % to 40 % share in 40 years

ings, certainly on the secondary side and almost certainly on the primary side up to 30 kV; and as stated above, RBP will have ruled the condenser bushing demand. Cast resin alternatives were just starting to gain market share as that technology matured and now more recently within the last 15 years composite bushings have become popular in some parts of the world. Condenser bushing technology for distribution transformers will now have migrated mostly to oil-impregnated paper (OIP) technology.

Market shares by type of bushing in the distribution transformer sector vary greatly from region to region, and there is not space here to go into the shares by region, but globally the shares by value are in the order of: condenser bushings 10 %, composite 15 %, ceramic 55 % and cast resin 20 %.

5. Power transformer bushing trends

There is greater diversity of bushing type in the power transformer sector, principally because of the large range of voltages and applications and the necessity to respond to advancements in T&D grid systems.

However, this does not mean that market trends will be anything but glacial. OIP technology has become the mainstay as a logical improvement on RBP bushings, but this has taken some time. The next generation “new technology” is resin impregnated paper (RIP); however, this was developed in the 1960s, had achieved a share in the order of 10 % in the 1990s and currently has a share in the order of 30 % – not exactly a meteoric rate. The industry has now developed resin impregnated synthetic (RIS) technology, with no filling material, hybrid types and SF6 bushings at higher and higher voltages. The total market size estimate for 2026 is shown earlier in the article – the breakdown by technology is not; in a few

more years it will be, although it is difficult to see a future that is not dominated by RIP given the production and storage advantages alone, and we will reserve our position on this debate.

The issue of ceramic versus composite housing is also topical at the moment. The pros and cons of this argument have been well aired in technical journals and throughout the industry; suffice it to say that the leading global producers of bushings offer both; but in the medium to long term the market share of composite technology in bushings is likely to mirror that experienced in other insulator markets 0 % to 40 % share in 40 years.

Author



Steve Aubertin is the Managing Director of Goulden Reports and following a first career in electrical engineering has spent the last 30 years researching and reporting on the global market for electrical products in both published and in the form of tailored research for specific clients.