

GE INSTRUMENT TRANSFORMERS

HISTORICAL

In 1949 General Electric introduced the first successful molded instrument transformer, the Type JKM-3, 5 kV Indoor Butyl Current Transformer.

The first Hy-bute/60 transformer introduced by General Electric in 1955 was the Type JKW-5 outdoor 15kV current transformer. This was the breakthrough needed to produce a complete line of butyl-molded CT's and PT's.

Some of the major steps leading to this complete line were:

1955 – Type JKW-5 Outdoor 15 kV Current Transformer.

1962 – All types molded in Hy-bute/60 including indoor and outdoor.

1965 – Super-Bute. Extension of Hy-bute/60 insulation to 25-69 kV outdoor CT's and PT's.

GE HY-BUTE/60

In 1955, General Electric discovered a new formulation for butyl that would not arc-track, and named it Hy-bute/60. When surges or leakage currents subject the surface of Hy-bute/60 to temperatures high enough to cause burning of the transformer insulation, no carbon residue results. This major insulation break-through was accomplished by adding large amounts of an oxidizing agent (Hydrated Alumina) to butyl as it was mixed and formulated. When high temperatures (sparks and scintillations) occur on the surface of Hy-bute/60, the chemical reaction that takes place between the surface arc and the hydrated-alumina in the butyl forms carbon dioxide, carbon monoxide or water, rather than free carbon. There is enough oxidizing material in Hy-bute/60 to last the full life of the transformer. Thus, for the first time, porcelain, with all its physical limitations, could be replaced by Hy-bute/60 as a high voltage insulating material. This also meant that since Hy-bute/60 could be molded, the insulating medium could become the case as well as the insulation for the transformer core and coil.

HY-BUTE/60 SUMMARY

Advantages of Hy-bute/60 in Use:

- Is elastic, making it tough and resilient when subjected to mechanical shock.
- Is resistant to heat, chemicals, ozone and ultraviolet.
- Does not harden or crack with age.
- Does not sustain combustion.
- Presents no explosion hazard
- Bonds well to metal.
- Has no Arc-Tracking
- Has high dielectric strength.

- Is non-porous and forms a homogenous insulation with no internal air spaces that could ionize and cause radio interference.
- Has excellent heat dissipation making possible smaller and lighter units while allowing for greater operating rating factors.
- Provides for permanent positioning of core and coils, even when subjected to high surge currents. This also leads to greater sustained accuracy over the life of the unit.
- Can be molded in large masses without danger of shrinkage cracks.
- Has higher rating factors – Thermal, Mechanical, Overload
- Presents creepage and strike distances equal to next higher voltage level (i.e. 15 kV butyl CT's and PT's have 25 kV creep and strike distances)

BUTYL AGING

The only indication of butyl aging is a visual one, where the surface color turns from black to gray. The gray coloration that occurs on the surface of Hy-bute/60 over a period of time is caused by ultra-violet radiation from sunlight. Most plastic materials, of which butyl is a part, start to decompose when subjected to ultra-violet radiation. With Hy-bute/60, surface decomposition occurs slowly over a period of two to three years. In time, these decomposition products form a protective surface coating that prevents further penetration into the material. In Hy-bute/60 the penetration is minute being less than 1/64 of an inch. Since 60% of the surface decomposition remains hydrated alumina, the protective function of converting the by-product of any electrical surface-arc from carbon to a hydrocarbon gas has not been affected. Thus, the non-tracking characteristics of Hy-bute/60 are fully retained while the transformer is in service.

FIELD EXPERIENCE

Since 1955 GE has produced hundreds of thousands of instrument transformers using the Hy-bute/60 butyl rubber compound. Decades of field experience have proven that GE instrument transformers provide highly accurate and reliable service for our customers.

TOTAL COST OF OWNERSHIP

When evaluating the cost of instrument transformers, it is important to consider the total cost of ownership, which includes the initial cost, the cost of replacing failed units (material, labor and downtime), the life expectancy and the disposal cost. The GE butyl instrument transformers offer the lowest failure rate and the longest life expectancy in the market today, resulting in the most attractive total cost ownership. Also as opposed to oil-filled units, the cost of disposal is very low.

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In addition to proven designs using superior materials, GE has continuously implemented improvements in manufacturing equipment as technology has changed. GE instrument transformers manufactured in Somersworth continue to rely on a highly trained and experienced workforce. Many GE employees involved in transformer production have more

than 30 years of experience and this expertise results in the high quality and high reliability transformers produced today.

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