

WHY USE COPPER RATHER THAN ALUMINIUM IN POWER TRANSFORMERS?

Transformers are used to adjust the delivery voltages across electricity generation, distribution and use. While modern EU designs already operate typically with a high efficiency, transformer efficiency matters because of their omni-presence (an estimated 4 million units across the EU).

IMPROVE ENERGY PERFORMANCE AND LOWERS LIFECYCLE COSTS

A study commissioned by the European Commission showed that the lowest lifecycle cost design uses substantially more copper.

NO GALVANIC ACTION

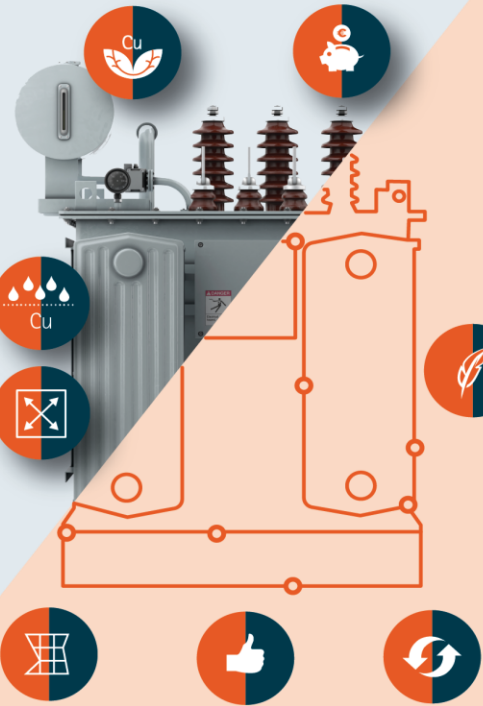
Copper wires have no galvanic action, as they are the same element as the connectors, usually made of copper or brass (a copper alloy). Aluminium loses material through galvanic action, leading to a loss of contact.

HARDER, STRONGER, MORE DUCTILE, EXPANDS LESS AND DOES NOT FLOW AT TERMINATIONS

Consequently it does not require periodic inspection and tightening of screw joints. Aluminium flows away from the termination under pressure.

LOWER LEVELS OF CREEP

Because copper displays low levels of creep (tendency to cold flow), copper wound transformers are less likely to fail in service. Under extreme loading and temperature conditions, the creep rates of aluminium can be up to 25 times higher.



LESS EXPENSIVE TO MANUFACTURE

Transformers with copper windings are often less expensive to manufacture. This is because it is not just the cost of conductor, but also the cost of magnetic steel, tank and oil needed to achieve the specified energy performance, that determines the total.

SMALLER AND LIGHTER

Copper wound distribution transformers are invariably smaller and lighter for the equivalent capacity and energy performance. Given its high resistivity, the cross-section of the aluminium conductor needs to be 1.66 times larger for the same resistance. This results in a larger transformer core and volume. While aluminium is lighter, this benefit is nullified by the increased volume (and thus weight) of the steel core, tank and oil charge.

LESS PRONE TO FAILURE

Due to the different behaviours of their oxide forms, copper wire terminations are less prone to failure. Copper oxide is soft, electrically conductive, and breaks down easily. Aluminium oxide is hard to dislodge, electrically insulating and prevents non-mechanical connections, such as soldering, unless a layer of tin, copper or nickel is applied.

HIGHER VALUE OF COPPER SCRAP

At their end of life, the higher value of copper scrap encourages transformer recovery, enables recycling and thus supports the EU's goals for resource efficiency and the circular economy.