Toshiba Industrial Products and Systems Corporation

High-efficiency Transformers Friendly to the Global Environment

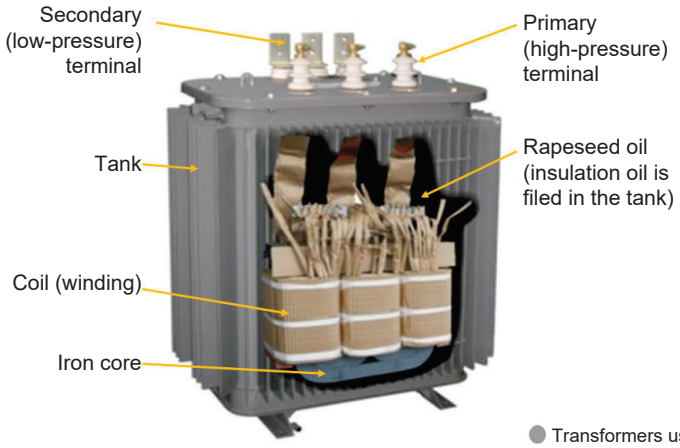
Features

- This is a transformer that uses rapeseed oil to minimize negative impact on the global environment, including global warming.
- Achieved low loss exceeding the “Top Runner Approach 2014” executed since 2014
- Excellent flame resistance performance can extend expected life

Basic Concept or Summary

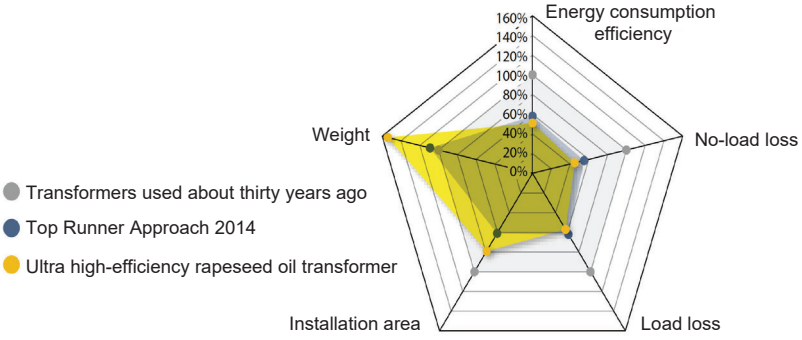
- Transformers using rapeseed oil as an insulating oil lower loss, achieving energy conservation. Rapeseed oil is a carbon-neutral natural material derived from pressed rapeseeds. Because the oil is plant-based, it makes transformers more eco-friendly than those using mineral-derived insulating oil. Because the flash point higher than mineral oil, rapeseed oil is safer in the event of a disaster.

Structural drawing of a oil-immersed transformer



Low-loss technology

Loss	Section	Major reason	Low-loss technology
No-load loss	Iron core	Magnetic resistance	Improving materials & structure Thinning iron core
Low-load loss	Coil	Electric resistance	Replacing aluminum with copper Shortening winding length Thinning insulators



For 50Hz 3-phase 500kVA

- Comparison of insulating oils: Mineral oil vs. rapeseed oil

Item	Mineral oil insulation	Rapeseed oil insulation
Insulation and cooling medium	Mineral oil	Rapeseed oil
Substances mitigating environmental burdens	Fair	Excellent
Substances mitigating environmental burdens	Not contained	Not contained
LCA* (CO_2 emission)	High	Low
Biodgradation performance of insulation oil	Not possible	Possible
Flash point (typical data)	132°C	334°C
Insulation performance	Excellent	Excellent
Cooling performance	Excellent	Excellent

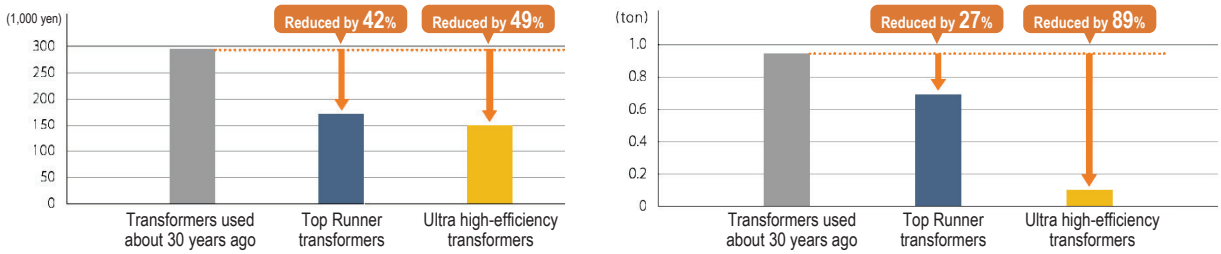
* LCA: Life Cycle Assessment

Rapeseed oil has better flame-retardant features due to higher flash point than mineral oils (commonly used for hydraulic transformers).

Flash point Mineral oil: 132°C < Rapeseed oil: 334°C

Effects or Remarks

◆ Energy-saving performance is higher than the Top Runner Transformer 2014, meaning that superior low-loss features drastically cut CO2 emissions and power bills compared to those from thirty years ago.

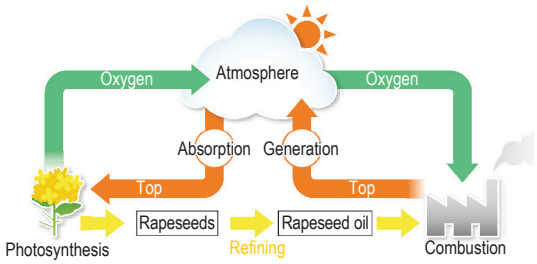


CO_2 emission coefficient: 0.554kg – CO_2/kWh (Source: 2014 coefficient indicated in the “Environmental Action Plan for Electric Industries” issued by Federation of Electric Power Companies in September 2015)

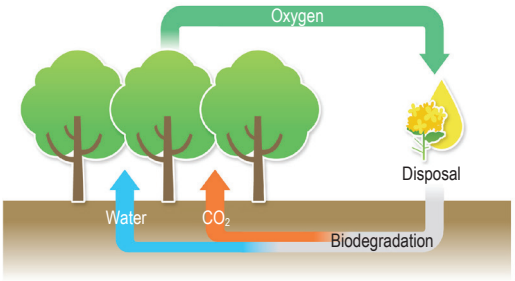
Electric power charge: 16 yen/kWh
Number of workdays: 365/year
Operating time: 24 hours/day
Load rate: 40%
For 50Hz 3-phase 500kVA

◆ Eco-friendliness

- Reduces CO_2
  (zero increase in total atmosphere nitrogen)
  Because the plant absorbs nitrogen from the rape blossom stage, total atmospheric nitrogen does not increase even if it emits CO_2 during production process and waste disposal.
  (Carbon neutral)



- Prevents soil contamination
  (Mitigates environmental impact)
  If accidentally spilled on the earth, microorganisms can degrade it to minimize environmental impact.



Installation in Practice or Schedule

Domestic Launched May 2016

Contact: **Toshiba Industrial Products and Systems Corporation**
URL: http://www.toshiba-tips.co.jp/contact/