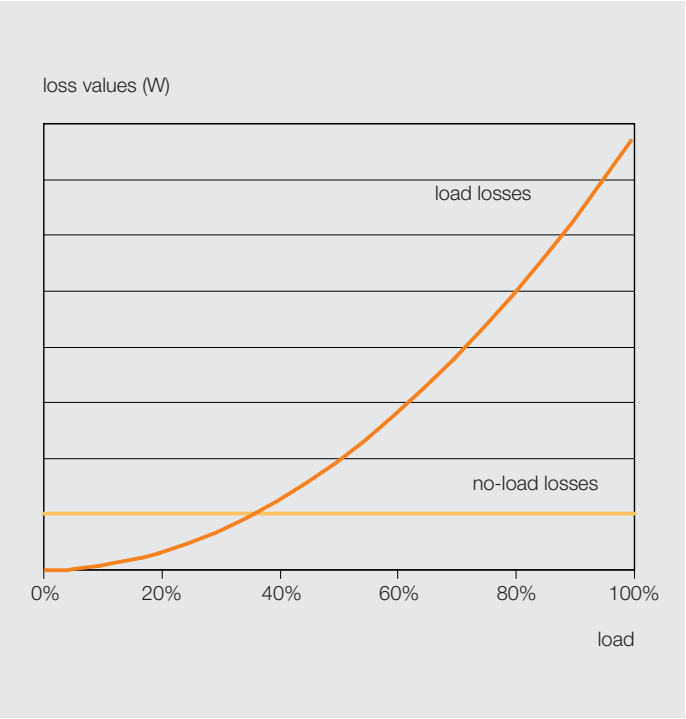
Dry-type transformers

EcoDry: Ultra-efficient dry-type transformers
Lower environmental impact while cutting your costs

Power and productivity
for a better world™

ABB has acknowledged the need for protecting our climate and environment for quite some time and as such prioritizes eco-compatibility in all our products. Our new ultra-efficient dry-type transformers have been greatly improved in terms of efficiency, specifically tailored to the particular application identified, for customers with a commitment to environmental protection and cost awareness.



Losses in dependence on the transformer's load profile

Our responsibilities

Environmental protection and climate change rank among the paramount issues confronting us today. Responsible conservation of resources has always been conducive to sustainable management, but today, more than ever, the business community has to deploy energy efficient products in order to guard against the risk of rising energy prices and to reduce the emissions of CO_2. We at ABB are working smarter to offer our customers solutions of enhanced energy-efficiency.

With our EcoDry product range of ultra-efficient dry-type transformers, we offer our customers distribution transformers where they can both, minimize their environmental impact and save operating costs at once. Depending on the customer's application, we utilize different technologies, each of them geared to providing the most favorable solution for the particular purpose involved.

Our answer

Losses from transformers have to be approached differently, depending on the average loading: if loading is low, the no-load losses will show up substantially in the figures; if loading is high, the load losses will be preponderant. This is clearly apparent from the diagram above.

No-load or iron losses are caused by fluctuating magnetization of the core (hysteresis loss) and by eddy currents in the core. These losses occur as soon as the transformer is energized, and they do not alter as the load rises. The reduction in no-load losses is thus of particular relevance for weakly loaded transformers.

Load or copper losses occur in the conductors due to ohmic loss and eddy currents. They increase with the square of the load, and reducing them is an important factor in the case of heavily loaded transformers.

We address both kinds of loss, and have a solution for each load profile case. For the sake of the natural environment, we offer with our EcoDry family cost-efficient solutions with all the advantages of our dry-type transformer technologies for your own applications: the EcoDry^{Basic}, which is particularly well suited for power utilities, the EcoDry^{99Plus} for the manufacturing sector, and the EcoDry^{Ultra}, which combines the advantages of both these types.

Why dry-type transformers?

Dry-type transformers from ABB stand for superior technical characteristics, rendering them suitable for a wide range of applications. They are safe, eco-friendly, reliable, and renowned for lengthy useful lifetimes.

Dry-type transformers are an optimum solution for transformers that have to be installed near their place of use. They thus save installation outlay on cabling, while at the same time reduce losses in cables on the low-voltage side.

A safe, eco-friendly, top-quality solution:

- No fire risk: self-extinguishing, minimized smoke formation, explosion-proof
- No risk whatever of pollutants or fire-hazardous substances escaping
- Lengthy lifetime thanks to ultra-durable materials
- High mechanical strength for withstanding shocks and vibrations – operationally safe even in earthquake-hazard regions
- Excellent characteristics for coping with load changes, overloads, short-circuits and overvoltages
- Outstanding advantages in terms of harmonic, converter and rectifier applications
- Reduced installation footprint, no costs for fire protection and oil-pit features

ABB is one of the world's largest manufacturers of transformers, offering an extensive portfolio of distribution and power transformers, components and transformer service support. ABB has installed more dry-type transformers worldwide than any of its competitors.

ABB is the technological leader when it comes to dry-type transformers, offering long years of comprehensive experience and the broadest range of applications, both for vacuum-cast (VCC) and for glass-fiber-reinforced (RESIBLOC®) cast-resin dry-type transformers. Our transformers have been running for decades in demanding applications, and under extreme environmental conditions.

Maximally efficient transformers for your own applications – losses cut by 70 percent

We offer the various technologies involved to suit the customer's own particular application: for distribution transformers with a low mean load the dry-type transformer EcoDry^{Basic}, and for those with a high to very high load profile, the EcoDry^{99Plus}.

All dry-type transformers from ABB, even in their standard versions, meet all the applicable standards as well as the customer-specific requirements involved. The further improved efficiency levels of the EcoDry range, as compared to standard transformers are depicted in the diagram below.

As the graph shows, the best efficiency levels for the various types of transformer are dependent on the load involved, and thus on the application concerned. At low loads, EcoDry^{Basic} reduces the losses by up to 70 percent compared to standard dry-type transformers. At an averaged high transformer load level, EcoDry^{99Plus} achieves energy savings of over 30 percent. EcoDry^{Ultra} is used when periods of weak and high load alternate quite often, or the average load is in the medium range.

Environmental protection made by ABB

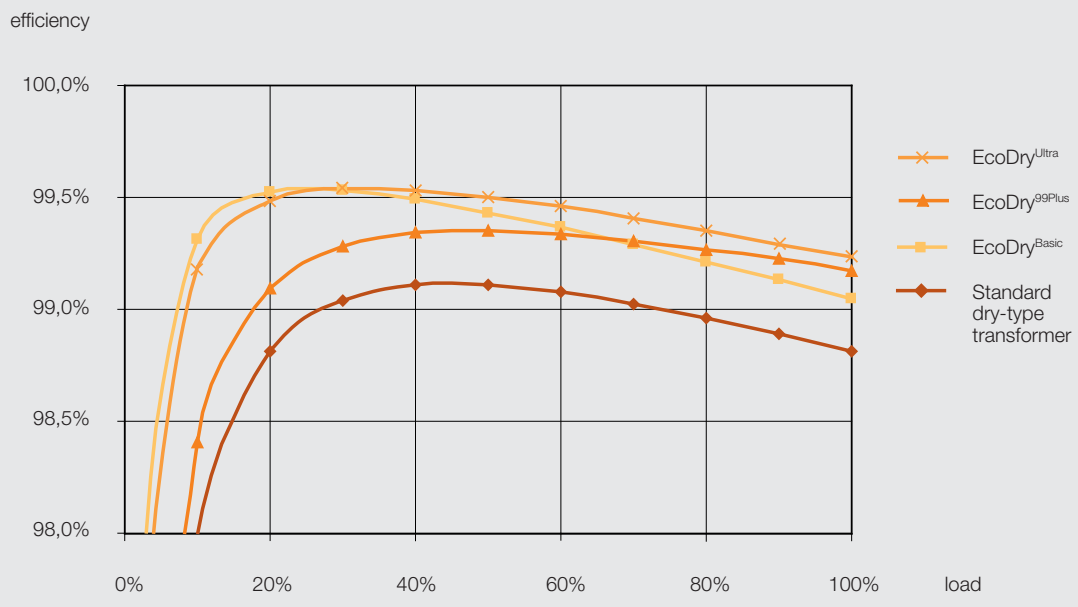
With our technological leadership, we offer you optimized quality for both standard and special products. We use the most advanced production technologies available and sophisticated control systems, all designed to guarantee products of maximized quality and dependability.

Now we've gone one step further for you and for the natural environment, and used our leading-edge technology to ensure that you can deploy more environmental protection while at the same time cutting your operating costs.

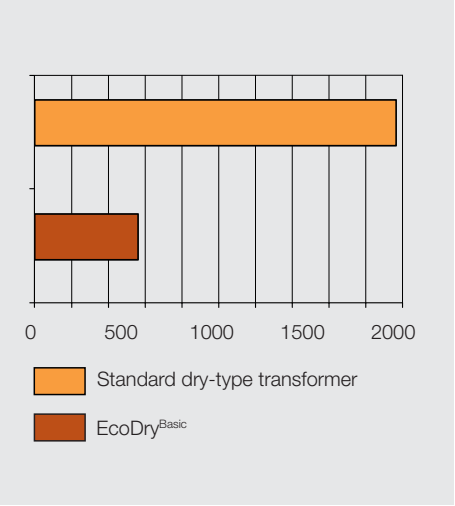
	EcoDry^{Basic}	EcoDry^{99Plus}	EcoDry^{Ultra}
Voltage range	up to 36 kV	up to 36 kV	up to 36 kV
Rating	up to 4,000 kVA	up to 4,000 kVA	up to 4,000 kVA

Other ratings and voltage ranges on request.

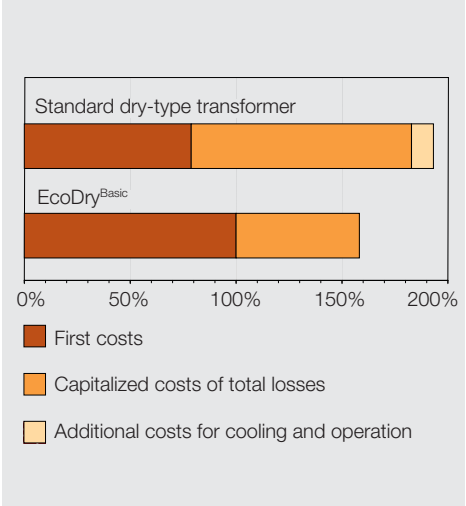
Efficiency comparison for 1,000 kVA transformers



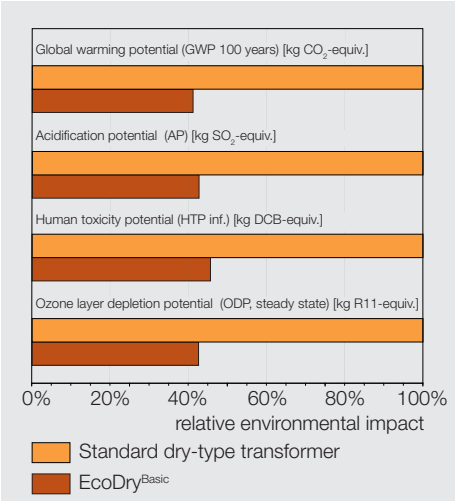
EcoDry^{Basic}



Comparison of no-load losses (W) for a 1,000 kVA transformer



Typical comparison of life-cycle costs for an EcoDry transformer and a standard dry-type transformer, factoring in the losses



Comparison of environmental data for a mean load of 20 percent, 1,000 kVA dry-type transformer

Power utilities operate millions of distribution transformers that transform the medium voltage down to the low-voltage level. In the European Union alone, 4.5 million of these transformers have already been installed, causing 38 TWh of losses each year – more than the entire amount of electricity consumed by Denmark – and 30 million tons of CO_2. The EcoDry transformer enables the losses and the CO_2 emissions to be reduced by more than 50 percent.

Distribution transformers at power utilities often see only a low mean load in actual operation. With low load profiles, it is the no-load losses that account for the major proportion of total losses and they are three to five times higher than the load losses. This means a significant reduction in no-load losses is one of the paramount considerations for the EcoDry^{Basic}. When combined with an optimized design for the load losses, it is our solution for use at power utilities.

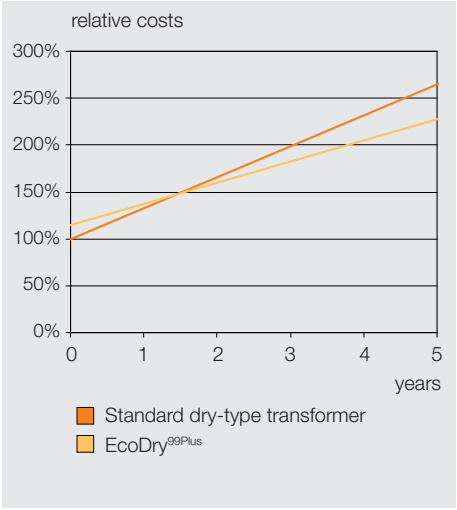
Source: SEEDT – Strategies for development and diffusion of Energy-Efficient Distribution Transformers; "Analysis of existing situation of energy efficient transformers – technical and non-technical solutions", Project No. EIE/05/ 056&SI2.419632, by R. Targosz et al., Aug. 2008

EcoDry^{Basic} is a high-tech product, based on 30 years of experience, and has been developed using the very latest simulation methods for a loss-optimized design. The EcoDry^{Basic} features state-of-the-art materials and top-quality components, including amorphous metal as the core material, which has proven its durability and reliability in distribution transformers for more than 20 years.

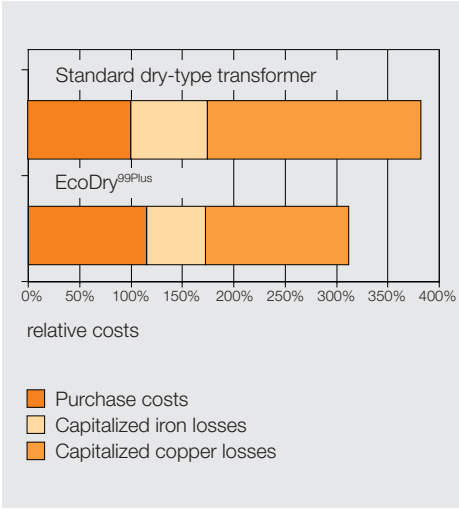
EcoDry^{Basic} exhibits outstanding ecological figures, not only in terms of energy losses and CO_2 emissions, but also in terms of other major environmental criteria. EcoDry^{Basic} is a conveniently affordable choice: the installation's footprint is reduced and as a result, no separate rooms are required for transformer installation. Extinguishing and protective devices to guard against fire are rendered superfluous, as are collecting devices for escaping oil; the low-voltage cable is shorter, with a resulting reduction in losses, the operating and capital investment costs for cooling can also be reduced.

In 20 years of operation, a 1,000 kVA transformer reduces the CO_2 emissions by 140,000 kg of CO_2 – this corresponds to 60,000 liters oil!

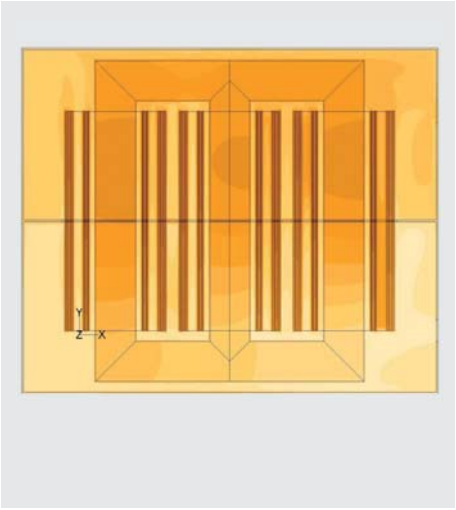
EcoDry99Plus



Cost-efficiency of EcoDry99Plus: amortization calculation (full load)



Typical comparison of life-cycle costs for EcoDry99Plus



Numerical simulation of a transformer's thermal behavior

In industrial applications with a high level of consistent power consumption or frequently changing loads, a mean loading amounting to 60 percent or more of the transformer's rating can be anticipated. The load losses resulting from the windings losses are accordingly high, and increase with the square of the rising load.

In the case of transformers used in energy-intensive industrial sectors, this means the costs of load losses and their reduction assume particular importance. ABB has accordingly incorporated design enhancements that significantly cut the load losses of its dry-type transformers, and is thus supplementing its new EcoDry product line to include the EcoDry99Plus.

The table shows that every year, with a single transformer from the EcoDry99Plus series, at full load more than 33,000 kWh can be saved, equivalent to the power consumption of 10 standard households. This is compared to a standard dry-type transformer.

Energy-savings with the EcoDry99Plus at full load

The annual savings on load losses create cost economies that depending on the load profile and the life-cycle of the transformer involved, can equal or even exceed the actual purchase costs.

EcoDry99Plus is a premium product for the most demanding of quality stipulations – now also for the very toughest of environmental conditions. The transformer has been used successfully for decades in demanding applications and under extreme environmental conditions.

	Standard dry-type transformer	EcoDry99Plus transformer
Rating	1,000 kVA	1,000 kVA
Voltage (primary)	10,000 V	10,000 V
No-load losses	2,000 W	1,500 W
Load losses (120 °C)	10,120 W	6,785 W
Total losses at full load	12,120 W	8,285 W
Efficiency at full load	98.79 %	99.17 %
Annual power losses	106,171 kWh	72,577 kWh
CO_2 emissions	57.4 t/a	39.3 t/a

EcoDry^{Ultra}

EcoDry^{Ultra} is the ultimate solution for reducing transformer losses. EcoDry^{Ultra} combines the advantages of EcoDry^{Basic} and EcoDry^{99Plus}, i.e. no-load and load losses are minimized simultaneously. The transformer is a preferred choice for applications where for reasons of redundancy the supply is fed through two transformers at the same time, and is accordingly operated at medium load on a continuous basis. This may be the case with pumping or ventilation systems.

Other important applications include renewable energies, particularly photovoltaics and wind power. Insolation and wind strength may vary quite considerably within a short time, with transformer load levels varying between low and high. EcoDry^{Ultra} both guarantees maximized harvest yield and also minimizes the load on the grid from the transformer's no-load losses in the event of cloudy or windless conditions.

1 EcoDry in a substation | 2 EcoDry in industry | 3 EcoDry with renewable energies


1


2


3

Contact us

ABB Ltd.
Affolternstrasse 44
P.O. Box 8131
CH-8050 Zurich, Switzerland

www.abb.com/transformers

Note:
We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB Ltd. does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

1LDE000076 en printed in Germany (05.11-2-Di)

Power and productivity
for a better world™