

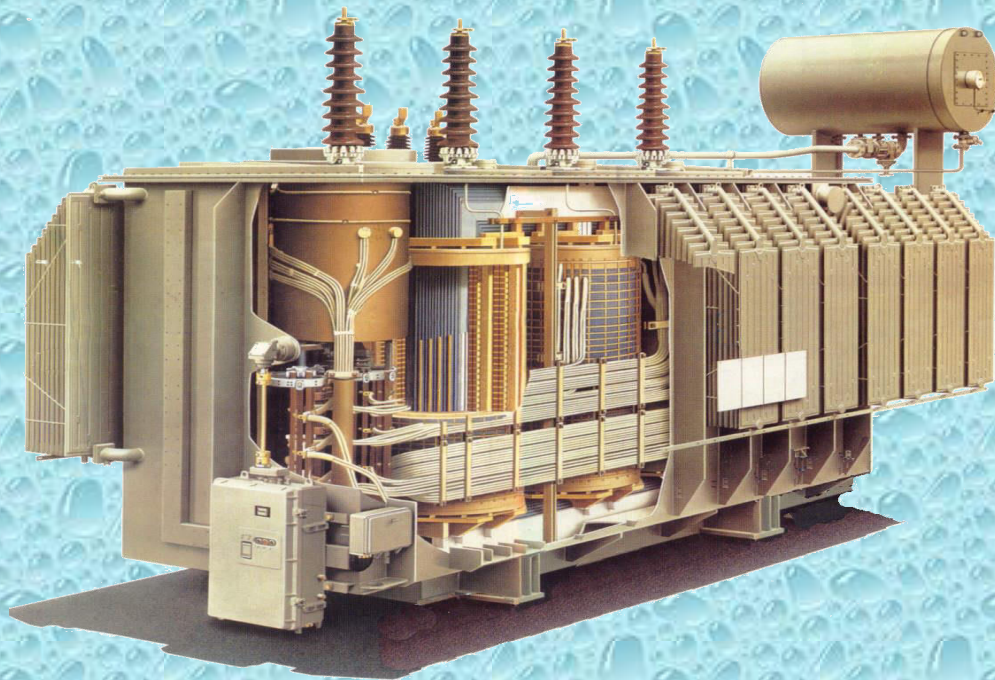
Voltamp Transformers Limited

(54 Years of Glorious Existence)

Presentation by : MD F MURSHED. MOB: 70860-19414

Welcomes ITMA, BIS & ICAI

20th July-2017



**ENERGY
EFFICIENT
TRANSFORMER**



Energy Efficient Transformer is an important means to reduce losses with improved active materials resulting drastic reduction of losses with respect to Transformers Manufactured in 1970's



Energy Efficient transformers realizes substantial SAVINGS in operation and Cost and thereby having a direct Impact on the Cost savings over a period of time—Pay Back Period with in few years.



Efficiency

$$\text{Efficiency} = \frac{\text{Output Power}}{\text{Input Power}} \times 100\% = \frac{\text{Input Power} - \text{Losses}}{\text{Input Power}} \times 100\%$$

Condition of Max Efficiency

When No Load Loss and Load loss is equal



LOSSES IN TRANSFORMER

➤ NO Load or Core Loss

(hysteresis loss = Steinmetz Formulae $B_{max} \times f^{1.6} \times V$ (Core volume)

Eddy loss proportional to f^2 & inversely to thickness

Independent of Loading and remain constant from NO Load to Full Load

➤ Load Loss, mainly Copper Loss

Depends on Copper resistivity, Winding Configuration to reduce wdg eddy

➤ Stray Losses mainly due to leakage flux



COPPER WEIGHT & LOSSES

A) Weight of Conductor (Kg) = $DALN$ where

D : Density of Copper -- 8900Kg/m³

A : Cross Section Area in m²

L : Mean Length of Winding

N : No of Turns

B) Load Loss = I^2R + eddy Current loss in wdg + Stray loss

C) Copper loss depends on Resistivity, C.S area of conductor, lower current density

D) Eddy current loss of winding depends on wdg Configuration

E) Stray loss depends on Leakage Flux

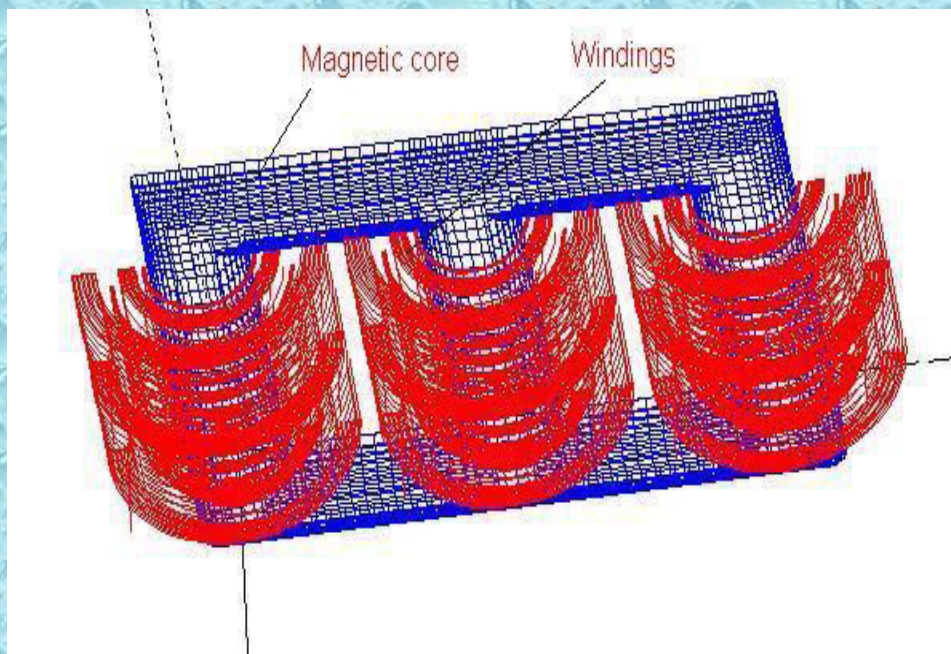
INFLUENCE OF CORE DIA, FLUX DENSITY & CORE LENGTH

Parameters	Increase Core Dia	Increase Flux Density	Increase Leg length
Copper weight	Decrease	Decrease	Increase
Load Loss	Decrease	Decrease	Increase
Core Weight	Increase	Decrease	Decrease
No Load Loss	Increase	Increase	Decrease



Main Parts of Transformer

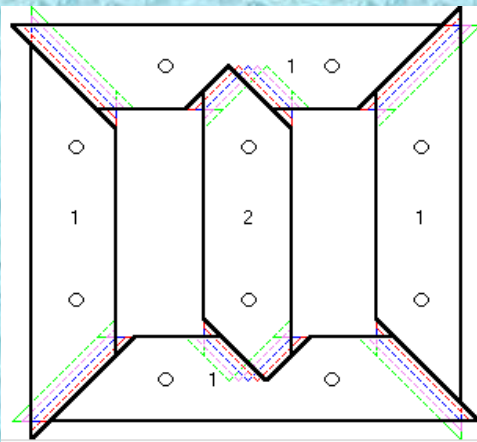
- Core - Contributing to No Load Losses
- Winding - Contributing to Load Losses



How to reduce Loss

- **Core**

- Use Higher Grade
- Thinner Laminations
- Reduce crowding of flux(Step Lap Const)



- **Winding**

- Use Special copper with higher CS
- Use more Copper or Use Copper Foils
- Reduce Axial and Radial Forces



COST OF ENERGY EFFICIENT TRANSFORMER

WHY MORE COST ?

LOWER COPPER LOSS

More Copper than Standard Transformer r.

LOWER IRON LOSS

Higher Grade CRGO laminations

LOWER MAGNETISATION (LOW FLUX DENSITY)

Longer Core Length

DESIGN OPTIMISED FOR HIGHEST EFFICIENCY

**Special winding
Geometry**

LOWER STRAY LOSS

**Special manufacturing process for high accuracies
and least variation of air gap**

Modified by : MFM



PAY BACK : 1 MVA 11/0.433KV

	IS 2026 ONAN	IS1180 ONAN	DRY
No Load Loss (Kw)	1.35	1.2	2.5
Full Load Loss	13.5	7.2	10.5
No Load energy consumed Annum	11826	10512	21900
Full Load Energy consumed/Annum	59130	31530	45990
Total Energy consumed /Annum	70956	42042	67890
Cost of Energy / Annum (assume Rs 7 per unit)	4.96	2.94	4.75 L
Approx Initial Price	7 L	11 L	9 L

PAY BACK PERIOD CALCULATION

$$\begin{aligned}\text{Therefore Pay Back Period} &= \frac{\text{Difference in price}}{\text{Cost for Difference in energy savings /Annum}} \\ &= \frac{11 - 7}{4.96 - 2.94} \\ &\text{i.e approx 2 Years}\end{aligned}$$



PAY BACK PERIOD CALCULATION

KVA	PAY BACK PERIOD (MONTHS)
500	28
1000	24
1250	26
1600	24

WHY WE SHOULD NOT GO

➤ *FOR ENERGY EFFICIENT*

TRANSFORMER ? ?





***VOLTAMP TRANSFORMES
LTD ALREADY CERTIFIED
BY BIS UP TO LEVEL 3 E.E.T.***



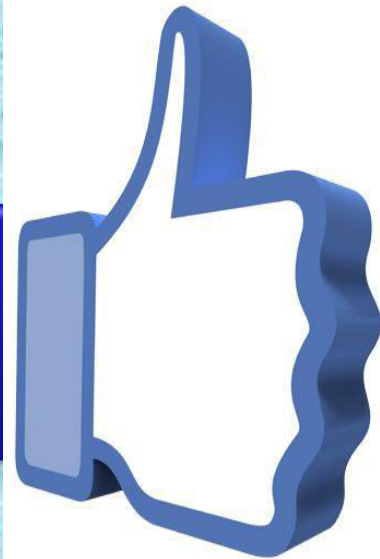
Manufacturer Perspective

- 1. BEE registration will also be necessary along with BIS certification ?
- BIS & BEE both loss figure will be done or will remain different ?



Already in use for 54 long years in prestigious installations

TRIED.TESTED.TRUSTED



Thank you!



SYSTEMS & SOLUTIONS