

Hyrax Transformer Oil



“A Made In Malaysia Product
for the World”



Technical Presentation

Agenda



- Introduction & Short Background of Company
- Transformer Insulation System
- Transformer oil Functions and Its Manufacture
- Transformer oil Specifications
- Hyrax Transformer Oils
- QC and Handling of Transformer Oil
- Our Facilities
- Summary and Q & A



About The Company



Then

- ✓ **Established In 1991 As A Trader of Automotive Spare Parts & Distributor of Imported Lubricants**

Now

- ✓ **One Of The Fastest Growing Independent Lube Blenders in Malaysia With Markets In More Than 30 Countries.**

Future

- ✓ **We Will Be The Leading Lubes & Transformer oil Manufacturer In Malaysia and Exporter of Petroleum Products The World Over**
- ✓ **Our Name Will Be SYNONYMOUS With Products of High Quality, Performance & Reliability.**



Why Hyrax?

- ✓ An ISO 9001:2008 Certified Company
- ✓ Preferred Vendor for TNB
- ✓ Specializing In Transformer Oil and Lubricants
- ✓ Comprehensive Infrastructural Set Up
- ✓ Workforce Comprising Of Industry Experts
- ✓ Complying to International Standards Of QUALITY
- ✓ In-house Testing Laboratory With Modern & Accurate Equipment



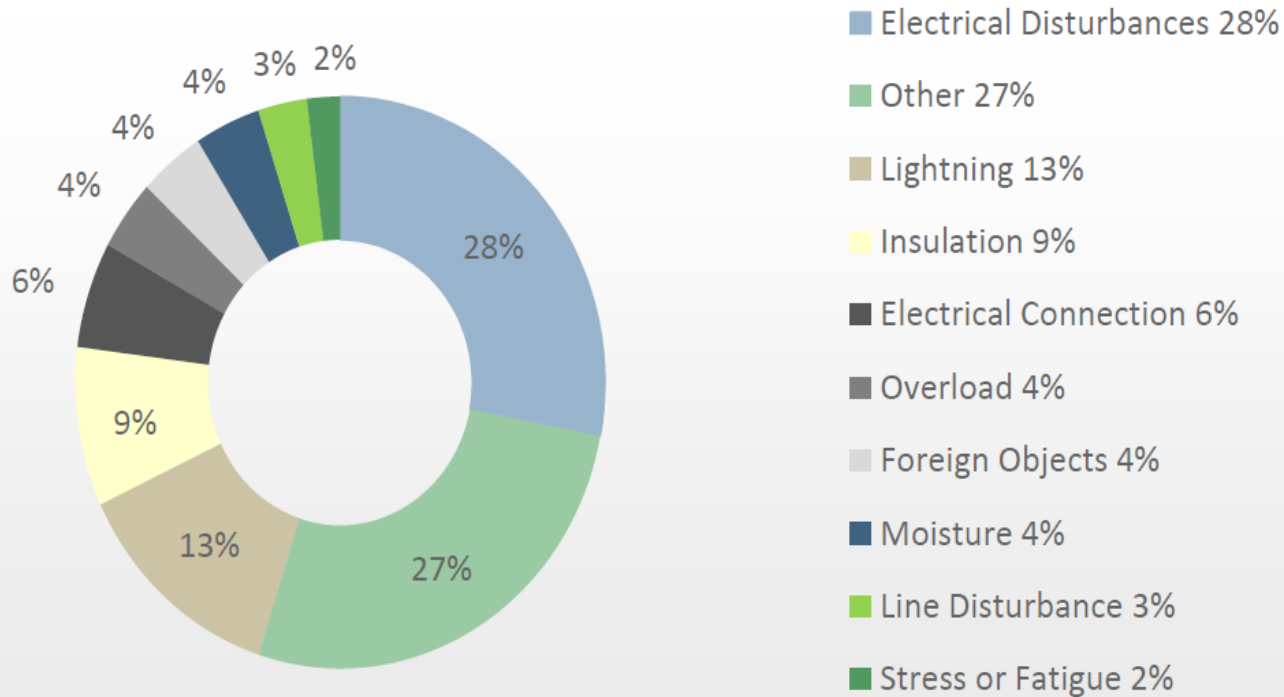
Challenges



Failure Causes - Transformers



Causes of Transformer Failures Over the Past 20 Years as a % of Total Failures



Electrical Disturbances are the Leading Cause of Transformer Failures and the Most Severe

Source : 2012 Doble Eng. Co, 79th Annual International Doble Client Conference.

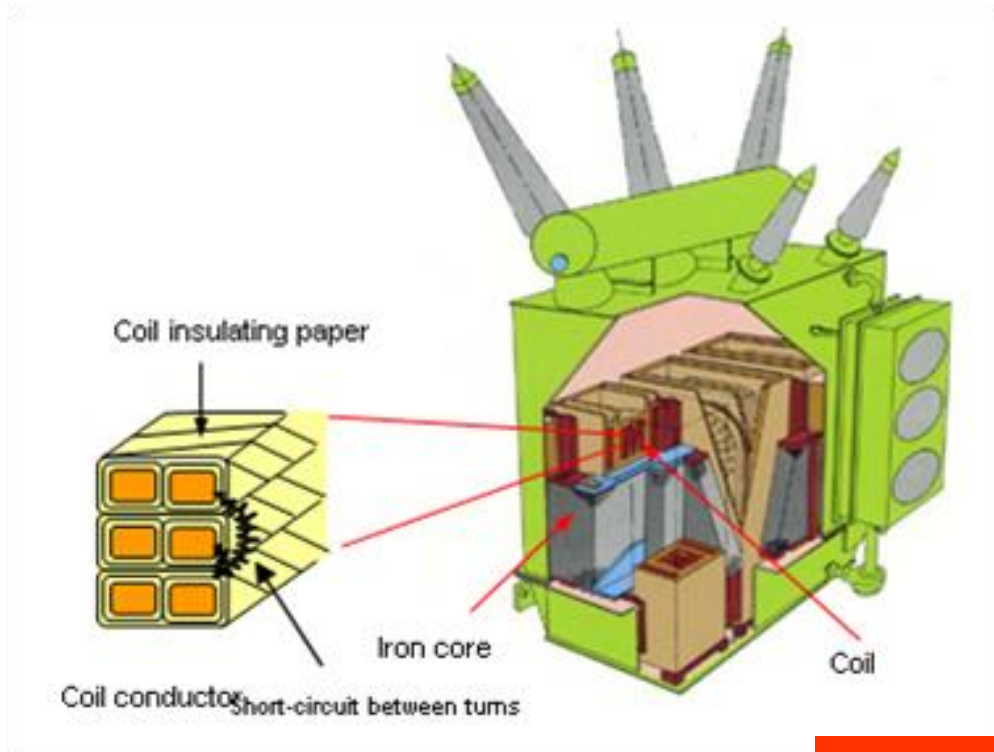
“ Analysis Of Transformer Failures,” by William P.E, Hartford Steam Boiler. Insp & Insurance.

A Bit Info on A Transformer



**“An Engineering Marvel With
Remarkable History. Patented
About More Than 100 years
Ago. It May Represent The Most
Crucial and Vulnerable Link in
Today’s Total Energy”**

A Transformer Parts



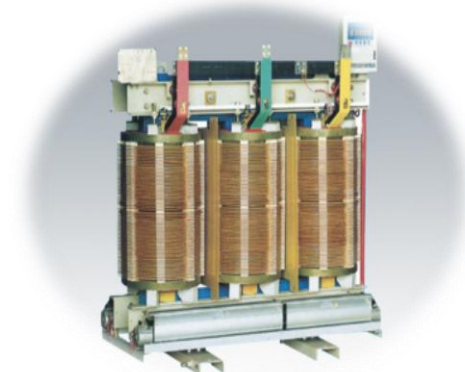
Internal

Transformer Insulation System

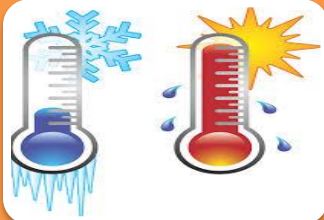


Significance

- Insulation Is The most **IMPORTANT** Part Of Transformers To Maintain and Monitor
- It Is The **WEAKEST LINK** In Transformers
- Life Of The **INSULATION** Is The Life Of The Transformers
- It Requires **EARLY** and **PROMPT** Attention When There Is Incipient Warning!
- In Germany About 40 % Of All Transformer Faults Are Due To The Failed Insulation System, Where Ageing Is the most **IMPORTANT** Factor.



Transformer Oil- Functions



Cooling Medium

.To prevent overheating due to “loss heat”



Electrical Insulation

- Dielectric Strength /Breakdown Voltage



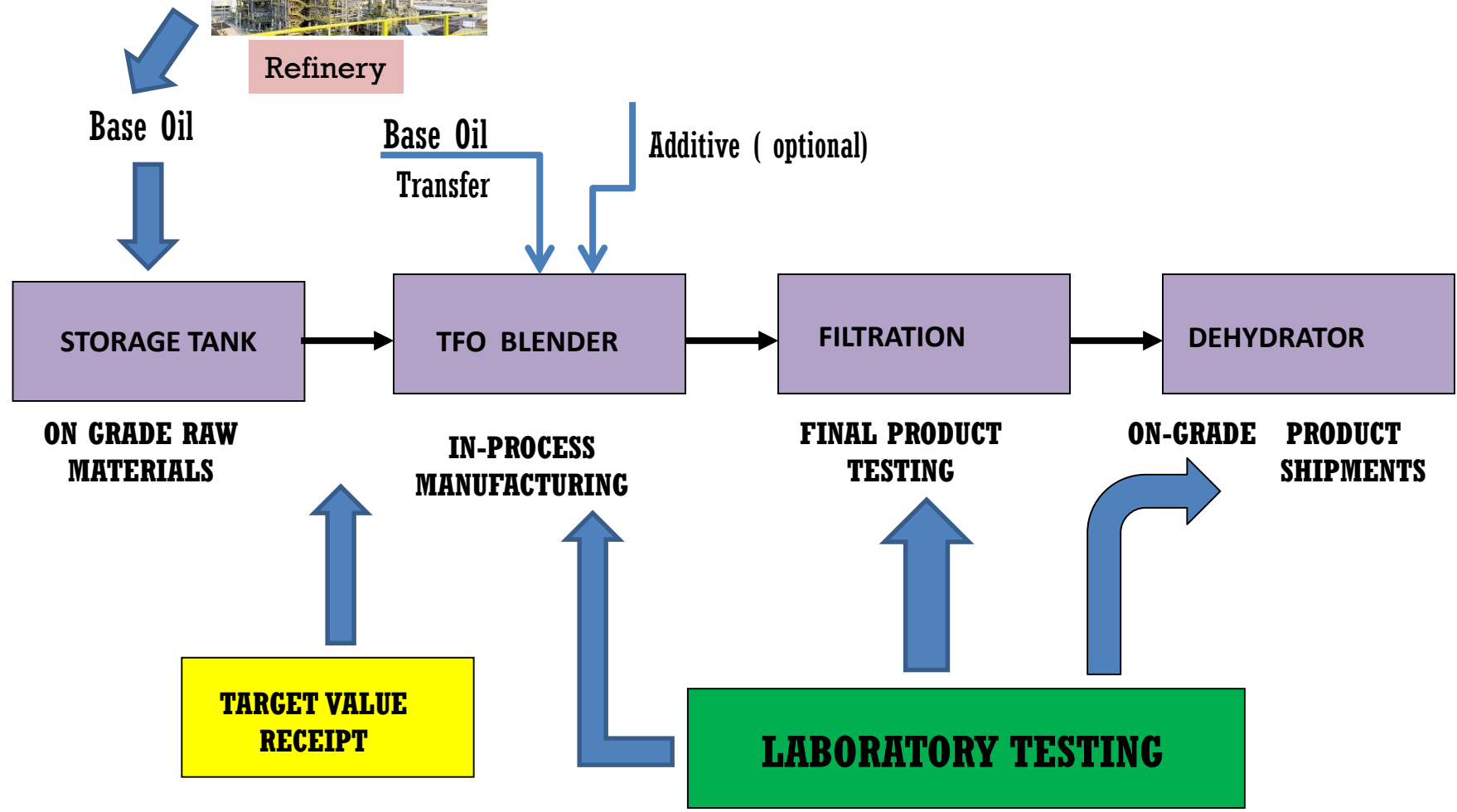
Information carrier of in-service transformers

- Ageing
- Abnormality on operating conditions
- Transformer lifetime

Transformer Oil Manufacturing Process & Its Quality Control



Refinery



International Specifications For Mineral Transformer And Switchgear Oils



IEC 60296 Ed 4



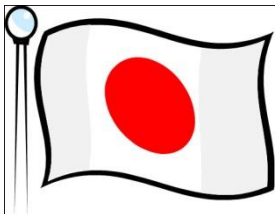
MS 2322:2010



DIN 57370 /
VDE 0370



GB-T2536/ SH0040



JIS C2320 Class 1



ASTM D 3487



INTERNATIONAL STANDARD

IEC 60296

Edition 4.0 2012-02



Table 2 – General specifications

Property	Test method	Limits	
		Transformer oil	Low temperature switchgear oil
1 – Function			
Viscosity at 40 °C	ISO 3104	Max. 12 mm ² /s	Max. 3,5 mm ² /s
Viscosity at –30 °C ^a	ISO 3104	Max. 1 800 mm ² /s	–
Viscosity at –40 °C ^b	IEC 61868	–	Max. 400 mm ² /s
Pour point	ISO 3016	Max. –40 °C	Max. –60 °C
Water content	IEC 60814	Max. 30 mg/kg ^c / 40 mg/kg ^d	
Breakdown voltage	IEC 60156	Min. 30 kV / 70 kV ^e	
Density at 20 °C	ISO 3675 or ISO 12185	Max. 0,895 g/ml	
DDF at 90 °C	IEC 60247 or IEC 61620	Max. 0,005	
Particle content	IEC 60970	No general requirement ^f	



INTERNATIONAL STANDARD

IEC 60296

Edition 4.0 2012-02



2 – Refining/stability		
Appearance	–	Clear, free from sediment and suspended matter
Acidity	IEC 62021-1 or 62021-2	Max. 0,01 mg KOH/g
Interfacial tension	EN 14210 or ASTM D971	No general requirement ^f
Total sulphur content	IP 373 or ISO 14596	No general requirement
Corrosive sulphur	DIN 51353	Not corrosive
Potentially corrosive sulphur	IEC 62535	Not corrosive
DBDS	IEC 62697-1 (in preparation)	Not detectable (< 5 mg/kg)
Inhibitors of IEC 60666	IEC 60666	(U) uninhibited oil: not detectable (< 0,01%) (T) trace inhibited oil: < 0,08 % (I) inhibited oils: 0,08 % – 0,40 % (see 3.6 to 3.8)
Metal passivator additives of IEC 60666	IEC 60666	Not detectable (< 5mg/kg), or as agreed upon with the purchaser
Other additives		See ^g
2-Furfural and related compounds content	IEC 61198	Not detectable (< 0,05 mg/kg) for each individual compound
Stray gassing	See 6.22	No general requirement ^h



INTERNATIONAL STANDARD

IEC 60296

Edition 4.0 2012-02



3 – Performance		
Oxidation stability	IEC 61125:1992 (Method C) Test duration ^k (U) Uninhibited oil: 164 h (T) Trace inhibited oil: 332 h (I) Inhibited oil: 500 h	For oils with other antioxidant additives and metal passivator additives, see 6.12.
- Total acidity ^l	1.9.4 of IEC 61125:1992	Max. 1,2 mg KOH/g
- Sludge ^l	1.9.1 of IEC 61125:1992	Max. 0,8 %
- DDF at 90 °C ^l	1.9.6 of IEC 61125, Amendment 1 (2004) + IEC 60247	Max. 0,500 ^l
Gassing tendency	IEC 60628:1985, Method A	No general requirement ^h
ECT	See 6.14	No general requirement ^h

Property	Test method	Limits	
		Transformer oil	Low temperature switchgear oil
4 – Health, safety and environment (HSE)			
Flash point	ISO 2719	Min. 135 °C	Min. 100 °C
PCA content	IP 346	Max. 3 %	
PCB content	IEC 61619	Not detectable (< 2 mg/kg)	

TRANSFORMER OIL GRADES

A) NAPHTHENIC OIL

Base Oils – Refined from sweet crude oil distillates. **Naphthenic base oils** have a very low aromatic content and a low paraffin (Wax) content. These characteristics allow for a low pour point on lighter viscosities and a high degree of solvency where heavier viscosities are required.



TRANSFORMER OIL GRADES



B) PARAFFINIC OIL

Paraffinic Base Oils (Often referred to as Group I, II & III) – **Base Stocks** produced using solvent refined & advanced hydrocracking processes. Some of the further developed **oils** also involve a catalytic de-waxing process to produce a more pure product. The aromatic content of these **oils** varies by the refining process used.



DIFFERENT BETWEEN NAPHTHENIC & PARAFFINIC



A) Paraffinic Oil

- Cheaper than Naphthenic

B) Naphthenic Oil

- Better performance offered compared to Paraffinic oil
- Why Naphthenic oil is better than Paraffinic



HYRAX'S TRANSFORMER OIL PRODUCT RANGE



- Naphthenic based
 - a) Hyrax Hypertrans
 - Uninhibited oil
 - IEC 60296 standard

 - b) Hyrax Hypertrans HR
 - Inhibited oil
 - IEC 60296 standard



HYRAX'S TRANSFORMER OIL PRODUCT RANGE



- Naphthenic based
 - a) Hyrax Elektrans I
 - Uninhibited oil
 - ASTM standard

 - b) Hyrax Elektrans II
 - Inhibited oil
 - ASTM standard



HYRAX'S TRANSFORMER OIL PRODUCT RANGE



- Paraffinic based
 - a) Hyrax Maltrans SP
 - Uninhibited oil
 - IEC standard

 - b) Hyrax Maltrans SPX
 - Inhibited oil
 - IEC standard



Why Hypertrans Transformer Oil?



- ✓ Highly refined Naphthenic Oil produced by Hydrotreatment process to remove Nitrogen, Oxygen & Sulfur containing materials; also converting aromatic and other unsaturated hydrocarbons
- ✓ Meets the latest **IEC 60296:2012 (4th Edition)**
- ✓ Approved by:
 - ✓ Doble Engineering- USA
 - ✓ Laborelec - Belgium
 - ✓ Egat- Thailand
 - ✓ EETC- Egypt
- ✓ Non Corrosive as tested by DIN 51353, IEC 62535 and ASTM D1275B
- ✓ Contains NO PCBs
- ✓ Contains NO DBDS
- ✓ Contains NO Passivators
- ✓ Compatible With Other Brand of Transformer Oil (Naphthenic)



Why Hyrax's Transformer Oil?



✓ We Supplied Our Transformer Oil to NOT only to Domestic Market (TNB & Transformer Mfgs) BUT Also International Markets:

- Bangladesh Power Development Board
- ABB in Vietnam and Riyadh
- Alstom and Daewoo
- Singapore
- Yemen
- South Africa





Overall Product's Attributes

- Severely Hydrotreated Naphthenic Oil
- Excellent Oxidation Stability
- Optimal Response to Synthetic Antioxidant
- Excellent Electrical Properties
- Non Corrosive Sulfur (free from DBDS)
- Long Service Life
- Compatible With Other Brands of Oil
- Competitively Priced



Overall Product's Attributes

- All Hyrax's Transformer Oils Are:
 - Non-Labelled
 - < 3 % PCA
 - Not Mutagenic (-tve Ames Test)
 - PCB's Free





Compatibility Test with Competitor's Product

Property	Unit	Method	IEC 60296	Hypertrans	Competitor
Density @ 20°C	Kg/L	ISO 3675	< 895	<0.895	<0.895
KV @ 40°C	cSt	ISO 3104	12 Max	9.05	8.71
Flash Point	°C	ISO 2719	135 Min	144.5	144
Corrosive Sulfur		IEC 62535	Non Corrosive	NC	NC
Breakdown Voltage	kV	IEC60156	30, Untreated	66	66
DDF @ 90°C		IEC 60247	0.005 Max	0.0008	0.003
Oxidation Stability		IEC 61125 C			
(164 hr / 120°C)					
Total Acidity	mgKOH/g		1.2 Max	<1.2	<1.2
Sludge	% Wt		0.8 Max	<0.8	<0.8
DDF @ 90°C			0.5 Max	<0.5	<0.5



TOGETHER WE POWER THE WORLD™
The World Leader in Diagnostic Instruments and Knowledge Services for Electric Power



**STATEMENT OF COMPLIANCE OR NONCOMPLIANCE
SAMPLE OF MINERAL INSULATING OIL**

This is to certify that:

**Sample 1
ELECTRICAL INSULATING OIL SAMPLE
(Doble Laboratory Reports 135797 and 138661)
Purchase Order Number 12967, 12968**

Was fully tested in accordance with:

IEC 60296:2012

"Fluids for electrotechnical applications-unused mineral
insulating oils for transformers and switchgear", Table 2

Uninhibited Oil

COMPLIANCE: The sample of electrical insulating oil submitted by Hyrax Oil Sdn Bhd fully complied with the above referenced specification for uninhibited oil (U) as referenced in Doble Engineering Report 135797.

Date: 3-27-2014

Lance Lewand
Director, Insulating Materials Laboratory
Doble Engineering Company
85 Walnut Street
Watertown, MA 02472 USA



Doble Engineering Company, 85 Walnut Street, Watertown.

www.doble.com



LABORELEC
GDF SVEZ



Author :
Bart Roggeman

Verification :
Julie Van Peteghem

Approbation :
Steve Eeckhoudt

Description of the sample

Sample N°	Description
1406.0008	Hyrax Hypertrans – Transformer Oil – Uninhibited – HO/LB/0514/032 (sample received June 2014)

Conclusion after testing

This unused uninhibited oil sample/type is conform to the specifications of table 2 'GENERAL SPECIFICATIONS' in IEC 60296 Ed.4 (version 02/2012) and the Laborelec criteria.





No. EGAT 255/2014

Certification Report

This is to certify that EGAT DGA Laboratory, High Voltage Testing Department has tested 2 transformer oil samples from HYRAX OIL SON BHD as

1. HYRAX HYPERTRANS TRANSFORMER OIL UNINHIBITED
2. HYRAX HYPERTRANS HR TRANSFORMER OIL INHIBITED

On these test items

1. Color (ASTM D1500)
2. Interfacial Tension (ASTM D971)
3. Relative Density (ASTM D1298)
4. Viscosity (ASTM D445)
5. Dielectric Breakdown Voltage (EC156)
6. Dielectric Breakdown Impulse Voltage (ASTM D3300)
7. Power Factor at 25 °c and 100 °c (ASTM D924)
8. Conductivity (IEC 6:620)
9. Resistivity (ASTM D1169)
10. Oxidation Stability (ASTM D2266)
11. Oxidation Inhibitor (ASTM D266)
12. Corrosive Sulfur (ASTM D1275-06XB)
13. Moisture in Oil (ASTM D1533)
14. Furfural Analysis (ASTM D5837)
15. Acid Number (ASTM D664-95)
16. Passivator (JIS C2101)

The test results of both samples are satisfied.

Issued on November 6, 2014

C. Prayoon

(Mr. Prayoon Changsuthivorawatana)
Chief, High Voltage Testing Department
Acting on behalf of Governor



Quality Control

Manufacture

- Analysis of Each Tank
- Quarterly Analytical Testing

Shipment

- Drum line Analysis and Retains
- Dedicated Lines for Product Movement
- Dedicated Tank Trucks For Bulk shipment

Delivery

- Customer Analysis Prior To Acceptance (FAT)



FAT : Factory Acceptance Test

Deterioration Of Electrical Insulating Oils



Public Enemies to Transformer Oils:-

- **Oxidation**-Most common cause of oil deterioration. Drying and vacuum processing, dry air or nitrogen sealing are means to minimize exposure to oxygen.
- **Contamination**- Chief among potential contaminants which provides a source of reactive products with oil in presence of heat

Sampling Of Mineral Electrical Insulating Oils



- The utmost care should be taken to avoid contamination of samples with external impurities such as DUST and MOISTURE.
- Attention is drawn to the danger of sampling in rainy or foggy weather.
- The hands of the sampler **SHOULD NOT** come into contact with the samples.
- Care should be taken when sampling oil colder than the surrounding air, to avoid contamination by condensation.

Sampling Of Mineral Electrical Insulating Oils

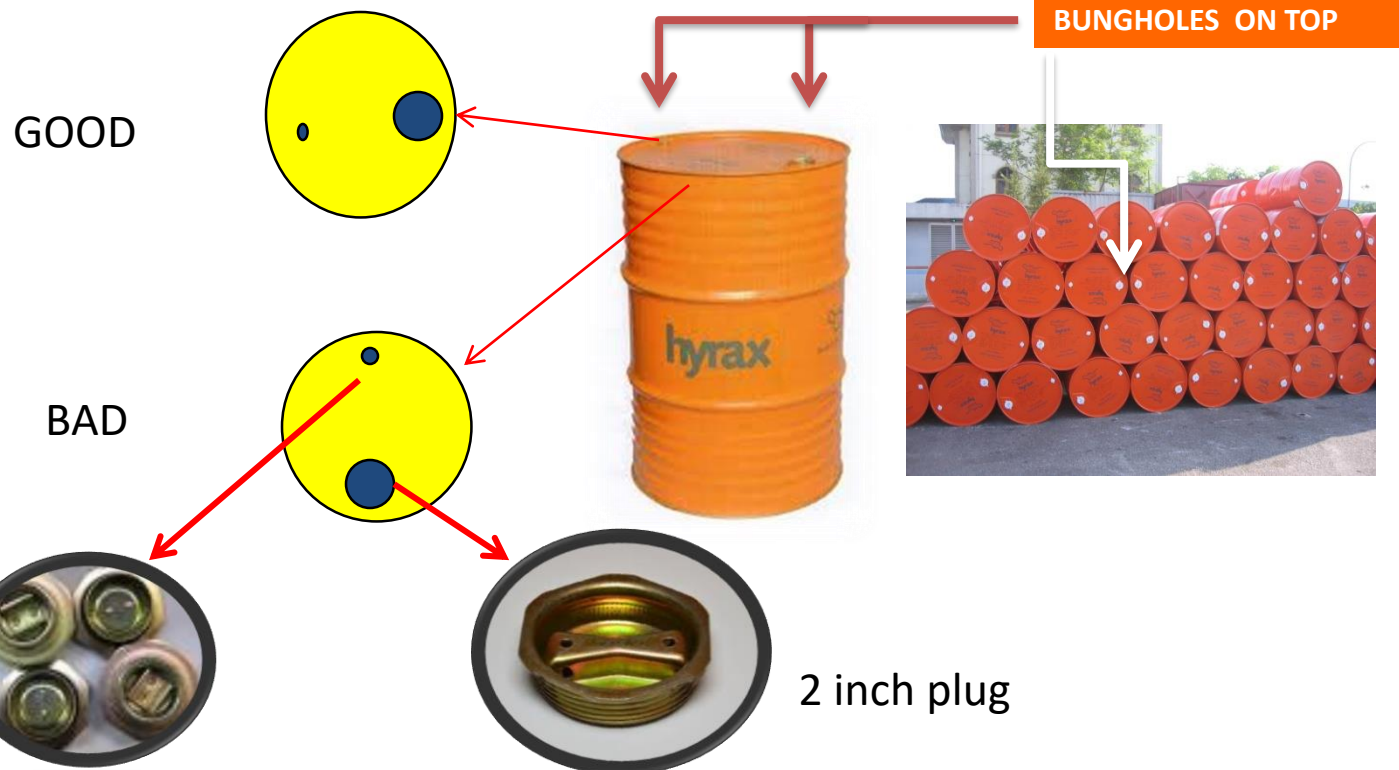


- Only glass sample containers, preferably fitted with ground glass stopper, should be used.
- Cotton waste or other fibrous materials should not be used to wipe the containers or apparatus.
- Where practicable, if a bottom sample is required the contents of the tank or package, after movement, should be allowed for at least 8Hrs,preferably 24Hrs before sampling.
- Before the actual sample is taken, the entire sampling apparatus and containers should be rinsed with the oil, which should then discarded

Drum Handling

Drums are best stored indoors on their sides (minimize moisture)

If outside, place in shade and not direct sunlight (minimize oxidation)



Our Laboratory



Principal Transformer Oil Laboratory Equipment



Viscosity Test



DDF Test



Acidity Test



IFT Test



Water Test



Breakdown Voltage Test



WE DON'T WANT THIS TO HAPPEN !



Transformers On FIRE

Conclusion

- Transformers Are Very Important In Our Daily Life Styles
- Use Only Quality Materials For Our Assets To Ensure Continuity
- Hyrax Hypertrans Oil Meets / exceeds IEC 60296:2012 and Customers' Requirements





hyraxoil[®]

better oil, better care



THANK YOU

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for the World”



Technical Presentation

