

## CASE STUDY

### PILOT PROJECT INSTALLED AT DUBAL, JABEL ALI, DUBAI, UAE October 20, 2017

**We believe in a healthy, reliable and well-maintained network. The goal is to optimize the performance of the transformer, extend its life, protect the environment, and create a safe and efficient work place.**

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#### **Moisture in the transformer is the enemy.**

The effect of moisture on insulation aging is well explained in various published papers and documented along with the damaging effect on insulation strength and partial discharge initiation level. It has also been shown that at high temperatures, the residual moisture in winding insulation can trigger the release of free gas bubbles, thus creating an immediate threat to the dielectric integrity of the insulation structure.

***Moisture will decrease dielectric strength, accelerate cellulose aging and cause the emission of gaseous bubbles at high temperatures.***

Maintenance managers and engineers are aware that a healthy transformer translates to increased efficiency, safe working environments and better bottom lines.

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#### **Where does moisture come from?**

Moisture accumulates in the transformer over the years of its operation. There are typically three sources of moisture for a transformer:

- 1) New transformers are meant to carry some moisture in the paper insulation as completely dry paper is too brittle and is not mechanically strong.
- 2) Free breathing transformers will add some moisture from the atmosphere through the conservator and through the breather.
- 3) Moisture creation inside the transformer paper insulation during normal operating conditions. This is a never ending cycle, one that cannot be stopped. As the paper is subjected to heat and starts to degrade, the cellulose chain breaks apart to form water which is then dissolved into the oil. As the paper degrades further, more moisture is created and further degrades the paper creating moisture and so on.

Point number 3 is of major concern and is the focus of **DryTrans**.

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#### **What are Continuous On-Line Moisture Management Systems?**

*Continuous Online Moisture Management Systems* for Oil filled transformers are a crucial necessity of any maintenance department.

It is now accepted, that no matter the oil filtration efforts, the transformer will never be rid of moisture. Once we accept this reality we are left with the only option, manage moisture effectively. If we cannot remove all the moisture from a transformer, we must manage its presence and not allow it to affect the reliability of the transformer.

This will require the use of an online moisture management system that is permanently affixed to the transformer and continually filters the moisture from the oil. Over 98% of moisture in a transformer is held within the solid insulation, and the oil acts as the medium to get to this moisture. Over time as the management system continues its operation and removes the moisture from the oil, the moisture from the solid insulation migrates to the oil and the process continues. It is absolutely imperative that the moisture be managed from an early stage to keep the transformer as healthy as possible and extend its operational life.

## ASSET DETAILS:

TRN Ratings:	MMS90 Specification:
TRN Name: GT-1 Aux. Transformer Ratings: 750 KVA Voltage: 11000/400 V Make: BRUSH TRANSFORMERS Year of Manufacture: 1976	Model: MMS90 Voltage: 230 VAC Make: DryTrans Year of Manufacture: 2017

## SELECTION CRITERIA:

AVACO has installed a Demo unit model MMS90 continuous online moisture management system on GT-1 Aux. Transformer, 750 KVA Generator Transformer. The MMS90 has been continuously in operation since January 3rd, 2017.

The GT-1 Aux. Transformer has been selected based on the following criteria:

1. It is a critical transformer (Generator Transformer).
2. Manufactured in 1976, 41 Years Old.
3. High Moisture Concentration in Oil, 33 PPM
4. High Moisture Concentration in winding insulation, confirmed by the moisture level returning to original level within a short period of time after filtration.

## OBSERVED AND RECORDED DATA:

Date	Moisture at Inlet of DryTrans MMS90	Moisture at Outlet of DryTrans MMS90	Alarm status with date and time	Remark or Comments
January 3rd 2017	33 PPM	2 PPM	No Alarms	Working Fine
February 3rd 2017	15 PPM	1 PPM	No Alarms	Working Fine
April 3rd 2017	8 PPM	2 PPM	No Alarms	Working Fine

## CONCLUSIONS:

It has been observed from the inlet moisture level that this transformer is of serious concern and that it will take some time for the MMS90 to do its job and reduce the moisture to acceptable levels, nevertheless, the MMS90 is working.

The moisture readings at the outlet confirms that the DryTrans MMS90 is working satisfactorily to reduce moisture concentration of the transformer oil and since it is a slow process, there is a better chance to get at the moisture in the solid insulation, which will in turn improve the health and life of the transformer.

## RECOMMENDATIONS AND ACTIONS:

1. We would recommend to keep the moisture level in the Transformer as low as possible and thereby slow the aging process and keep the paper healthy. MMS90 will help in managing the moisture level low in Oil as well as in winding paper insulation.

## NOTES:

It has been decided to extend the pilot period to another six months to observe further moisture reduction.

## RECOGNITION:

AVACO is very thankful to DUBAL Engineers and Staff for showing interest in the DryTrans MMS90 product. We will be delighted to work with you on future projects as well.

**PICTURES:**

Fig 1.1 DryTrans MMS90 Installation at DUBAL Plant, Jabel Ali, UAE

Fig 1.2 DryTrans MMS90 Installation at DUBAL Plant, Jabel Ali, UAE



