



**CLEAN OIL
BRIGHT IDEAS**

Tap Changer Oil Transformer Tap Changer

CJC™ Application Study

Application Study
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CUSTOMER

Sishen Iron Ore Mine, Kumba Iron Ore, Northern Cape, South Africa.
Kumba iron ore is the fourth largest producer of sea-borne iron ore in the world today exporting 73% of its 32 mt mined per year.

THE SYSTEM

20 MVA Transformer Tap Changers
Oil volume: 840 L
Oil type: Tap changer oil

THE PROBLEM

Thousands of tap changes per year result in production of millions of fine carbon particles being produced in the oil. Leaving them unchecked can result in flash or unexpected failure. Oil degradation products, such as oxidation formed in the oil reduce the effectiveness of the tap changer. Condensation due to continuous temperature fluctuation gradually increases the water content in the tap changer.

THE SELECTED SOLUTION

CJC™ Fine Filter HDU 27/27 PV (ABB specification) with **CJC™ Filter Insert BNK 27/27**, flow rate 120 L/h, designed to remove particles, water and oxidation products.

THE TEST

Comparison of tap changers on transformers **G10** and **G14** at Sishen Iron Ore Mine has been carried out:

G10 was serviced and filled with new oil in February 2009, The tap changer was only put onto automatic mode at the end of March 2009. **No filter was installed at any stage.**

G14 was serviced and filled with new oil on 2 Dec. 2008, at which point the **CJC™ Fine Filter** with ABB specification was installed. The tap changer ran on automatic since the service was completed.

A sample was taken on **G14** immediately after start-up, 1 month later, and 5 months later. A sample was taken at **G10** six weeks after being switched to automatic mode at end march 2009.

On 18th May 2009 both **G10**'s a 6 week sample as well as for **G14**'s a 5 month sample was taken. The samples were sent to Oilwatch in Capetown for analysis.

THE RESULT

New oil in **G14** was recorded at ISO 18/15/12, this cleanliness level was improved to 16/15/13 over the 5 months following, in fact leaving the tap changer cleaner than at the start of the test. ISO class 16/15/13 correlates to only 42700 particles per 100 ml of 4 micron and larger.

Comparatively **G10** in only six weeks showed a ISO class of 23/23/21 which correlates to an astounding 7,6 million particles per 100 ml of 4 micron and larger.

Interestingly the reduction in particles from 7,6 million to 42,700 equates to a difference of particle contamination of 99,45%. Also noted was that **water** was not detectable in the sample after 5 months. See photographic comparison of the **G10** and **G14** samples in bottles.



The Transformer Tap Changer at Sishen Iron Ore Company with the CJC™ Fine Filter HDU 27/27 PV installed

OIL SAMPLES



Transformer G10 without CJC™ Filter



Transformer G14 with CJC™ Filter

THE RESULT

	Transformer G10 without CJC™ Filter	Transformer G14 with CJC™ Filter after 5 months
ISO Code	23/23/21 *)	16/15/13 *)
Particles > 4 µm	76572	427
Particles > 5 µm	66005	257
Particles > 6 µm	56505	181

**) ISO Class 4409/1999, per 1 ml - Oil Samples taken by Oilwatch, Capetown*

Sishen Iron Ore Mine immediately requested quotations for the remaining 12 off 20 MVA transformer tap changers.