

PROJECT SUMMARY

DATE	2014	LOCATION	CEC Luano, Zambia
SUBJECT	Conversion of rotating excitation system to a static system		

Overview

Copperbelt Energy Corporation operate a twin RR Avon gas turbine generator (EA2) at their copper mine in Luano, Zambia. The unit operates in simple cycle mode and is used for grid support and for emergency generation to the mine in the event of grid supply failure. The gas turbine was installed by GEC in the mid 1970's.

The Problem

The original rotating excitation system consisted of:-

- Permanent magnet generator
- Pilot exciter
- Main exciter
- Rotating diode and resistor assembly
- Single channel AVR, maximum current output 15A



Figure 1 Generator & Exciter before modification

The exciter had developed a vibration problem which could not be cured despite repeated rebalancing exercises. In addition spare parts for the above equipment had become difficult to source and expensive. A decision was made to replace the rotating system with a static excitation system and CEC employed TCL to carry out this conversion.



The Solution

A new slip-ring assembly was designed to fit onto the generator main shaft mating with the existing main exciter coupling. The output connections of the slip rings connected to the tails of the generator rotor field winding.

A slip-ring pedestal was designed and constructed to house the slip-rings and provide cable connections for the field cables from the AVR output.

An excitation transformer was installed to provide the power for the AVR from the 11kV generator output

A Basler DECS200 based AVR was designed and installed to provide the excitation current direct to the generator rotor, via the new slip-ring assembly. The new AVR was rated at 450A full load current.

Figure 2 Slip-ring assembly installed

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The following equipment was removed:-

- Permanent magnet generator
- Pilot exciter
- Main exciter
- Rotating diode and resistor assembly
- Automatic voltage regulator

The following equipment was installed:-

- Rotating slip-ring assembly
- Slip-ring assembly pedestal
- Static automatic voltage regulator, max current 450A
- Excitation transformer

The completed installation was tested in various modes of operation, including parallel and island modes, to ensure compliance with the dynamic response characteristic requirements



Figure 3 Completed installation