

# ABB Advanced Power Electronics

**INCO, Grid intertie Converter with extended STATCOM functionality,  
Sorowako (South Sulawesi), Indonesia**

## Plant Overview



**ABB 32 MVA / 19 MW Converter – 2 Units**



# Introduction and Main Technical Features

AC arc furnaces are a major source of grid disturbances. The frequent interruption of the arc leads to strong voltage fluctuations and current unbalance between the three phases. A distorted grid increases the melting time of the metal in the arc furnace and leads to more stress and reduction of lifetime of the power generators due to the current unbalance in their windings.

The intertie converter station in Sorowako consists of two 32 MVA converters and connects the 11 kV/50 Hz grid of INCO with the industrial 33 kV/50 Hz grid to secure the bidirectional energy interchange between both grids as main function. In addition to the second task, their standard STATCOM function, the two converters on the industrial 33 kV grid include a load-balancing function, which is realized by means of negative sequence compensation. With this extended STATCOM function, the unbalance of the current can be reduced by a factor of nearly four.

The ABB converters are built with standard components and are easy to operate and transport thus allowing short installation and commissioning times. The selected standard converter layout results in short maintenance times. All components are designed for a long life cycle and are pre-tested by the supplier. Experience has shown that the converters provide high power availability.

## Functionality of the Control

The control system of the intertie converter station consists of three single-phase closed and open loop controllers. Each controller regulates the active power depending on the demand of the 11 kV/50 Hz side. Additionally the controllers adjust the reactive power on the 33 kV grid depending on the actual grid voltage. For the third task, the compensation of the negative sequence current, the controller measures the actual currents of the arc furnaces. According to this measurement each controller creates a negative sequence current, which is opposite to the negative sequence current of the arc furnace. Figure 1 shows the function of the two intertie converters with three current phasor diagrams in detail.

## Container and Cooling

The converter, its control system and auxiliaries are installed in a container, which is designed for outdoor use. An interlocking system is installed in the monitoring and control circuits for personnel safety. Outdoor dc link circuit components such as chokes and resistors are linked to the container. Stainless water pipes provide the connection to the cooling system. The cooling system is independent and has its own PLC to monitor and control itself. A redundant pump system circulates the processed water-glycol mix through the power converter and the heat exchanger.

## Transformers

The transformers are oil-filled, naturally cooled (ONAN) and designed for outdoor use. The 11 kV transformers are built with a 12-pulse configuration and supplied by the 3 AC 11 kV 50 Hz grid. The 33 kV transformers are summing transformers with two windings per phase to connect two H-bridges.

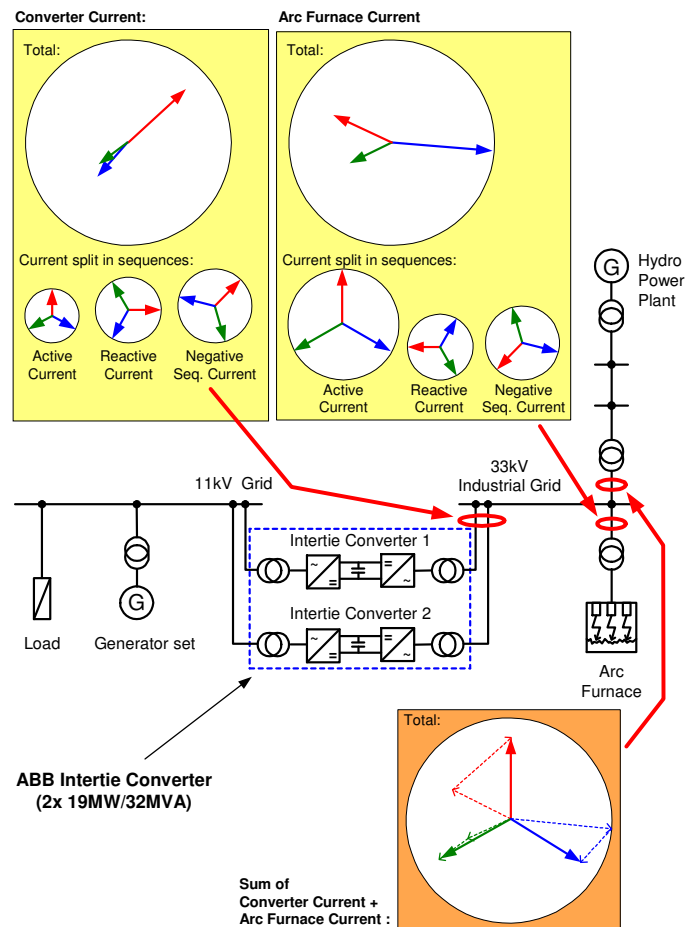


Figure 1: Functional overview

## Technical Data

Plant:	PT INTERNATIONAL NICKEL INDONESIA Tbk.
Applications:	Intertie converter / STATCOM
Installation:	Outdoor
Ambient conditions:	+10 °C - +35 °C
Number of units:	2
Frequency:	3AC 50 Hz +/-10% ↔ 3AC 50 Hz +/-10%
3-phase 50 Hz grid:	3AC 11 kV +/- 2.5%
Total / Unit AC apparent power grid:	38 / 19 MVA
3-phase 50 Hz industrial grid:	3AC 33kV +/- 8.0%
Total / Unit AC active power industrial grid:	36 / 18 MW
Total / Unit AC apparent power industrial grid:	64 / 32 MVA
Power converter cooling system:	Air / water-glycol
Transformer cooling system:	ONAN
Control technology / system:	ABB PSR-II / ABB Microscada



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