

Merus™ STATCOM enabling the operation of DC Electric Arc Furnace on weak islanded grid

Background

The steel plant presented here produces steel through a scrap route with DC Arc Furnace. The capacity of the furnace is 50-ton fed via furnace transformer of 38MVA with rectifier circuit. The plant is supplied through two power sources, i.e., a public network and independent gas turbines of their own. Apart from the arc furnace and ladle furnace, the plant also has auxiliary loads like a caster, rolling mill, and oxygen plant.

Challenge

The steel plant is connected to the public network which was quite weak with a fault level of less than 1000MVA and high voltage THD with a maximum value of 7.7%. In addition, the dynamic operation of the arc furnace caused voltage instability, rapid reactive power fluctuations, and high THD which makes the public network weaker and more unsuitable for commercial application.

Furthermore, plant auxiliary loads like the rolling mill and oxygen plant were severely affected by the operation of the DC Arc furnace. Voltage instability also affected the ladle furnace operation, thereby affecting the quality of steel due to unstable arc length.

Solution

Merus Power delivered a 45 MVar Merus™ STATCOM system as a turnkey project. Merus Power's scope of delivery included STATCOM modules, control and protection system, cooling system, filter capacitor bank, filter reactors, and complete engineering.

Total compensation ranges from -3 MVar (inductive) to +45 MVar (capacitive), divided between dynamic and static compensation. ± 24 MVar of active compensation was provided by 12 pcs of Merus™ M2000 STATCOM modules whereas the 21 MVar consist of capacitor banks tuned at 5th and 7th harmonic frequency.

Result

Merus™ STATCOM system was connected to the medium voltage 33 kV busbar. As per the post-commissioning report, Merus™ STATCOM reduced the voltage THD significantly and the fundamental reactive power to approximately 0 MVar with a power factor close to 1.0. The real-time response of Merus™ STATCOM not only met the dynamic demand created by DC Arc Furnace operation efficiently but also reduced the harmonic distortions significantly.



Application:
Steel industry, DC Electric Arc Furnace

Power quality issues:

- High voltage THD
- Reactive power fluctuations
- Voltage instability
- Harmonic distortions

Merus™ Solution:
45 MVar STATCOM system



Customer Benefits:

- Enabling the EAF operation on weak islanded grid
- Flicker mitigation
- Stable Voltage
- Improved Power Factor
- Reduced Harmonics
- Longer service life of equipment
- Increased productivity of the steel plant