

Modular Multilevel Converter based STATCOM for Electrical Arc Furnace (EAF) application



Steel plant Sremska Mitrovica, Serbia

Metalfer Steel Mill (MSM) is a Serbian steel plant, located in the Northwest of the country, close to the Croatian border. It is owning and operating an EAF-based steel mill manufacturing construction steel products from recycled scrap metal. They are the only rebar producer in Serbia and the leading supplier on the local market, also exporting to the neighboring countries.

MSM is part of Metalfer Group, an industrial group of companies involved in mining, metallurgy, energy, and trading, established in Serbia in 2002.

In November 2021, GE Power Conversion was awarded a contract to provide MSM with a STATCOM system to help stabilize the local grid.

Challenge

Our customer is operating a mini mill based on an Electric Arc Furnace (EAF) melt shop with a capacity of 400 kT/Y. The EAF is generating high voltage flicker, that the existing SVC system cannot compensate enough, preventing the facility from reaching the standard limit.

The flicker is causing significant power quality issues, to the plant itself but also to the neighborhood. As the Croatian authorities were complaining, MSM has been ordered by the local Transmission System Operator (TSO) to resolve the problem or to shut down the power.

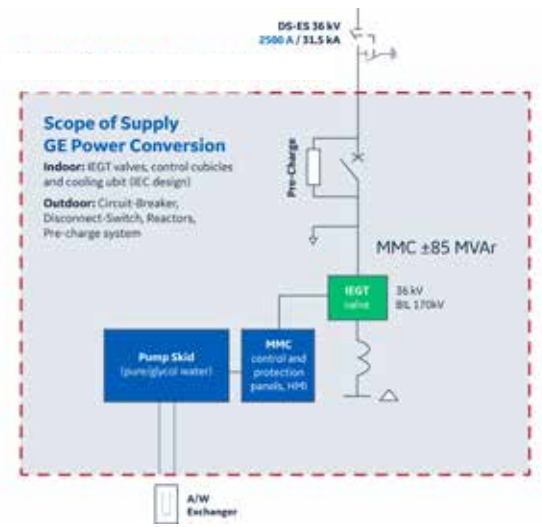
Solution

To answer this need for high compensation level, GE Power Conversion proposed a STATCOM system based on its Modular Multilevel Converter (MMC) technology. This advanced transformer less solution, using the MM7 drive, offers high performance with a flicker mitigation ratio up to 6.0 – a strong asset over competition that allowed GE to be selected for this project.

SCOPE OF SUPPLY

- MM7 STATCOM 20 kV/from -49MVar to +121 MVar
- 3 phases, each constituted by 5 towers
- Engineering, delivery, supervision of erection and commissioning

The equipment has been delivered at the end of 2022 and started operating in March 2023. It was then successfully tested in April 2023.



PRODUCT FOCUS

The MM7 is based on cascaded H bridges using medium voltage press-pack IGBTs. It is scalable in power through modular converter cells arrangement, and available in STATCOM configuration for grid connection up to 33 kV. It enables multi-level control with high power quality and efficiency.

It presents many advantages:

- **Optimized performance** for increased system stability and power quality
- **Improved efficiency**, up to 99.3% for the active part
- **Increased MTBF** (Mean Time Between Failure) and decreased MTTR (Mean Time to Repair) thanks to the modular design
- **Smart investment:** overall system's cost of ownership is competitive to available marketed solution

LOOKING AT THE FUTURE

In a near future, MSM intends to change the plant's bus voltage from 20 kV to 33 kV – a grid expansion that GE Power Conversion already anticipated and will therefore easily be implemented by adding 2 towers per phase to the MM7, thanks to the high flexibility of the solution.

Benefits

Despite a relatively low grid quality factor (X/R) and short-circuit level, Power Conversion's solution achieved a flicker reduction above 5, hence meeting the customer's expectations. On top of the technical performance, Dr Jelena Zakonovic, Metalfer Chief Executive Officer, highlighted the quality of project management based on "cooperation, hard work, challenge solving mindset".

		Standard limits	Measured values
Power factor of EAF load*		≥ 0.98	0.999
Voltage flicker**	Pst95%	< 0.8	0.653
	Plt95%	< 0.6	0.569
Voltage unbalance*	95%	< 1 %	0.25 %
Voltage Harmonic*	THD95%	< 3 %	< 0.7 %

*At customer substation

**At grid owner substation

About GE Power Conversion

GE Power Conversion, part of GE Vernova, applies the science and systems of power conversion to help drive the electric transformation of the world's energy infrastructure. Designing and delivering advanced motor, drive and control technologies that help improve the efficiency and decarbonization of energy-intense processes and systems, helping to accelerate the energy transition across marine, energy and industrial applications. GE Power Conversion is at the heart of electrifying tomorrow's energy.

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