Case Study

Enhancing Power Factor and Efficiency: Evaluating Elspec's Compact Equalizer Compensation System at a Motorcycle Plant Substation in Colombia

Colombia is known for its significant presence in the Latin American motorcycle market and has a well-established motorcycle manufacturing sector. Several major global motorcycle manufacturers have production facilities in the country, including Yamaha, Honda, Suzuki, and TVS Motors. These companies produce a wide range of motorcycles, catering to both domestic and international markets.

The Customer Situation

One of the motorcycle production facilities in Colombia experienced power quality issues specifically related to the 1600kVA transformer in the plant substation. The facility experienced voltage drops of up to 10%, caused by reactive power peaks that reached 380kVAr from an average of 200kVAr. Moreover, the voltage harmonics exceeded 5%. These issues affected machinery downtime & production efficiency and risked the company with penalties.

The customer sought an effective system to compensate for the power issues since the substation lacked capacitor banks or any form of compensation/ harmonic filtration system. The power delivered by the transformer was not being utilized optimally, leading to the need for an effective solution.

The Solution: Elspec Compact Equalizer Reactive Power Compensation System

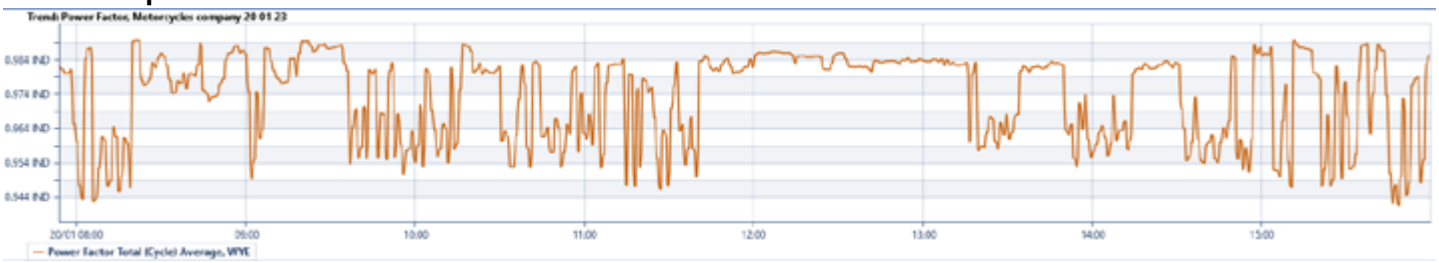
Elspec Compact Equalizer, a compact power quality system with a capacity of 210kvar was installed to compensate the power. It consisted of 7 steps, each providing 30kVAr. This is a small-sized dynamic VAR compensation system for transient-free power factor correction and dynamic load compensation at zero-crossing, including harmonics filtration. The system also included inductors set at 7% to address the power quality issues related to the transformer in the plant substation.

The Results

Power Factor: The Power Factor improved from average of 0.81IND to 0.97IND, placing the power factor values above the average value required by the national regulations.

Without the Equalizer

With the Equalizer

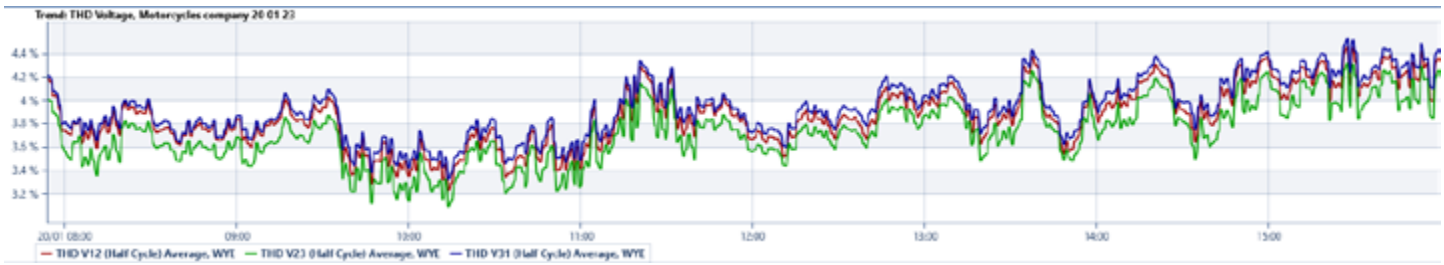


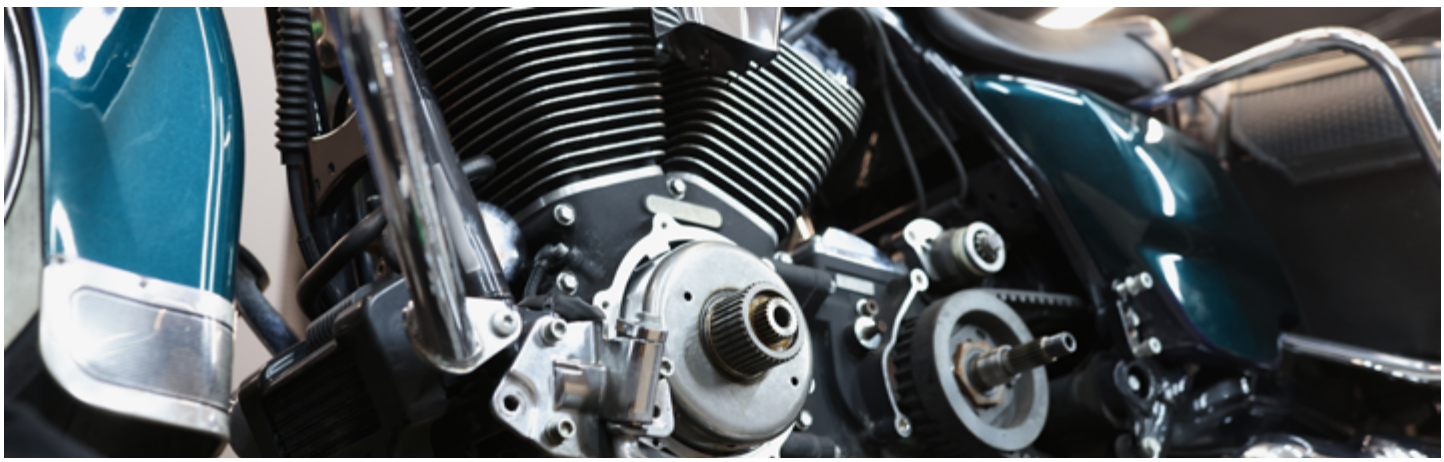
Reactive Power: 58.7% reduction in the transformer's reactive power was achieved. From an average demand value of 162kVAr, reaching peak demand of 375kVAr to an average demand of 66.8kVAr.

THD Voltage: The Harmonics voltage (THDV) was improved from 5% to 3.72%.

Without the Equalizer

With the Equalizer

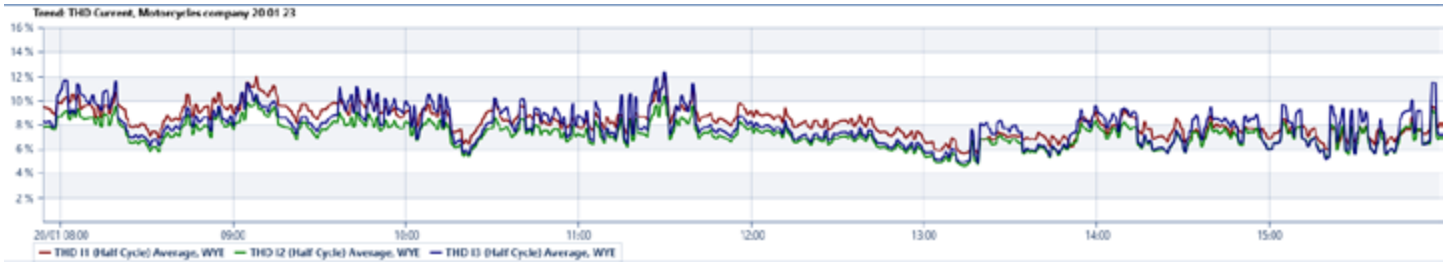




THD Current: The Harmonics current (THDI) was improved from 15.83 % to 8%.

Without the Equalizer

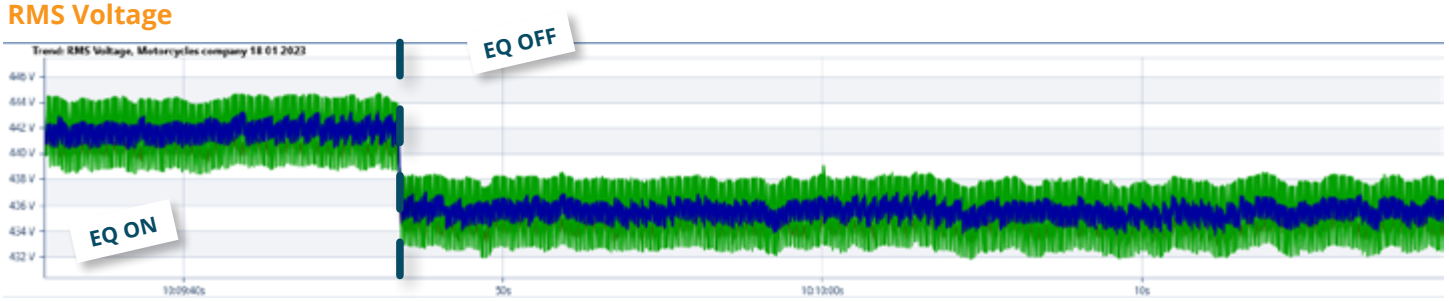
With the Equalizer



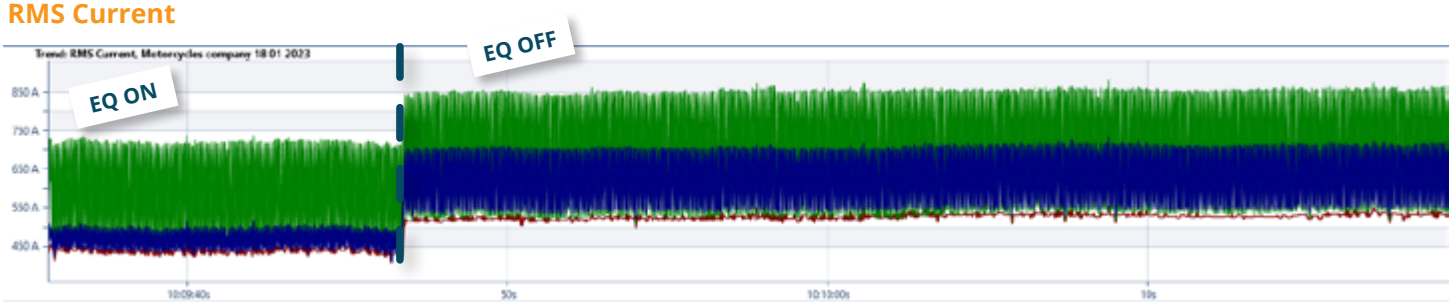
These results will significantly extend the useful life of the electronic equipment throughout the plant, including the transformer.

During the measurement, the 210kVAr EQ system was deactivated for short periods of time, in order to see its effect on the network associated with the main transformer of the plant.

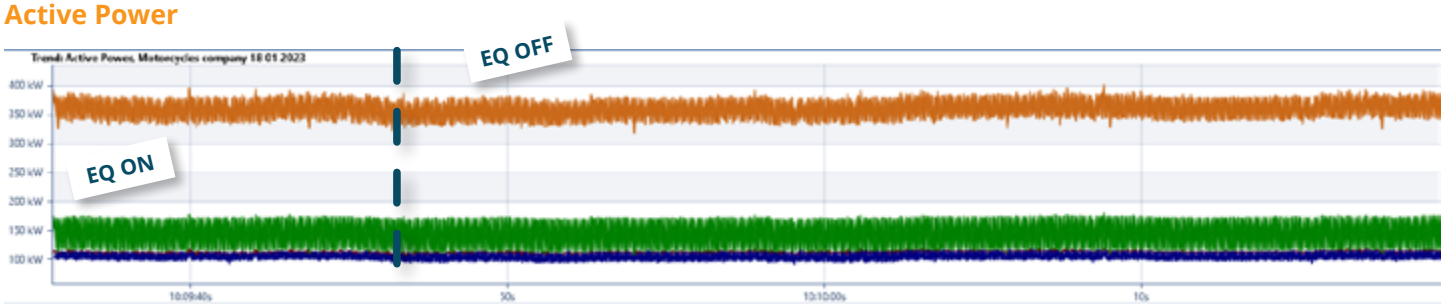
RMS Voltage



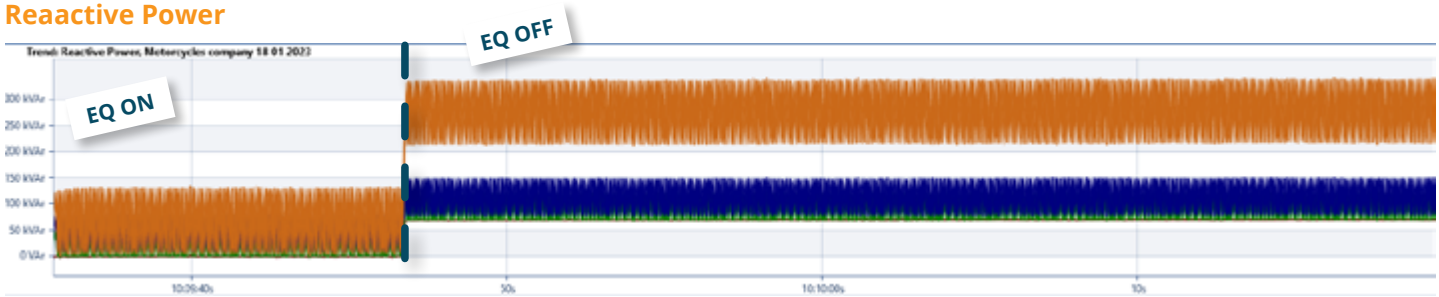
RMS Current



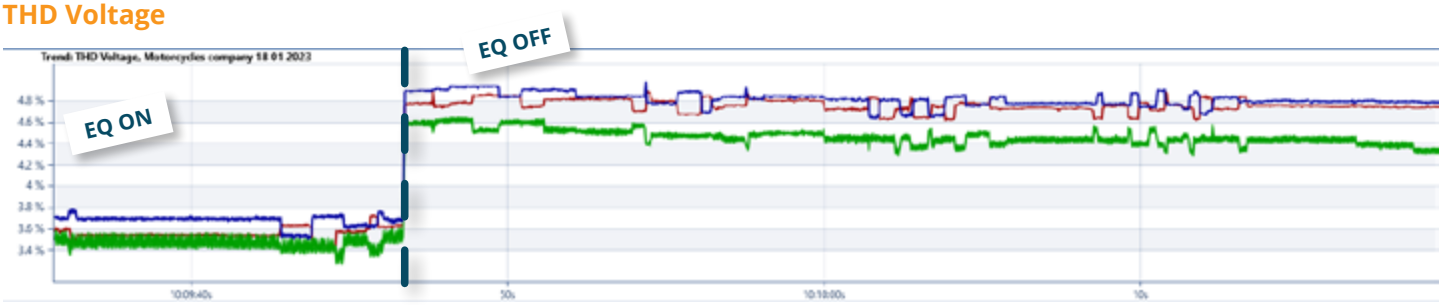
Active Power



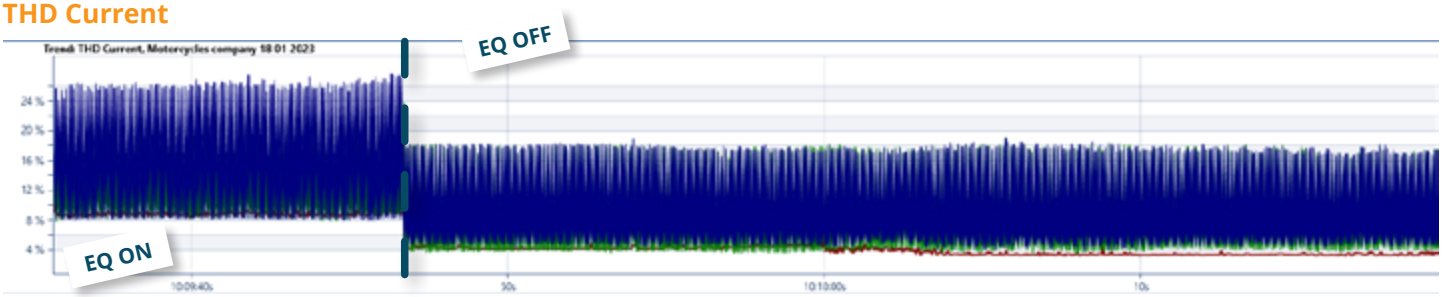
Reaactive Power



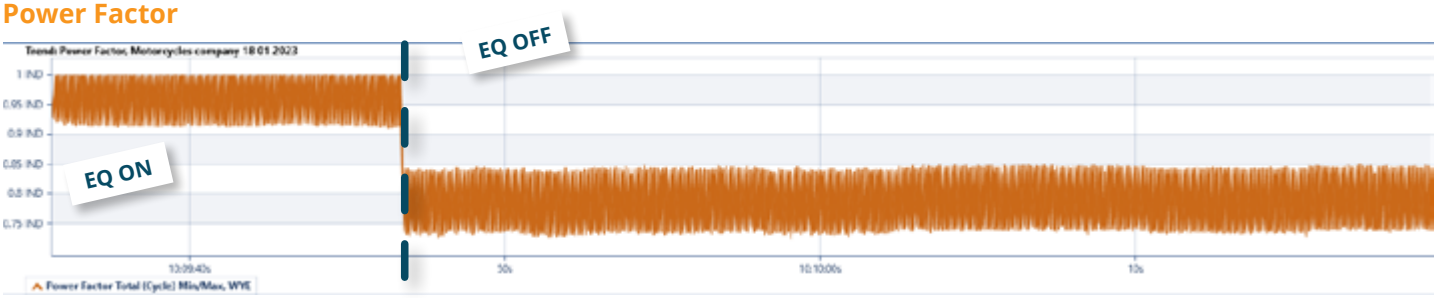
THD Voltage



THD Current



Power Factor



Conclusions

The implementation of the ELSPEC Equalizer system successfully increased and stabilized the Power Factor levels in the substation's transformer, optimizing the utilization of delivered power and preventing excessive transportation of reactive energy. This achievement helped mitigate the risk of potential penalties from the utility company. The average reactive power was significantly reduced by 73.2%. Reactive energy was significantly decreased by 85.27%, from 2.5MVArh to a projected value of 373kVArh. Furthermore, the system effectively reduced harmonic distortion in both voltage and current, preventing resonance phenomena and resulting in cleaner and more stable current waveforms. This improvement is expected to extend the lifespan of the compensation systems and transformers.

Another notable achievement is the improved efficiency in utilizing power delivered by the transformer. This has led to a higher conversion of power into effective work and a notable reduction in reactive power.