

Case Study

Stabilizing Voltage, Reducing Current Levels, And Increasing Power Factor In The US Food Processing Industry



In the US, food manufacturing and processing is a large and in-depth industry. It accounts for approximately 15% of the cost of all shipments and 13% of all employees of all US manufacturing sectors. As such, serious power quality problems need to be addressed and rectified as soon as possible to maintain production levels.

A large food manufacturing and processing plant in western US was experiencing power problems during full production runs. These problems consisted of low voltage, sub-optimal power factor, and increased current. This factory contains numerous motors, heaters, dryers and conveyors which require high levels of Reactive Power (VARs). During the factory's Full-Production operation, an Elspec G4500 continuous waveform recording analyzer was used to analyze the data. While analyzing the data, it was determined that during the recording period, the voltage levels decreased and the current levels increased. In addition, the power factor was shown to be around 0.83. This variability caused Power Quality issues to production equipment. The target which was set by the customer was to stabilize the voltage at or around 480V.

The Solution: Real-Time Reactive Power Compensation & Voltage Stabilization

After performing data analysis of the recorded data in Elspec's [power monitoring software](#), the PQSCADA Sapphire, it was decided to utilize and install a 1740kVAR [reactive power compensation system](#) – Elspec's Equalizer on the production line. The goal of the installation was to stabilize the voltage at or around 480V, reduce the current, and increase the power factor. This would increase production up time, reduce potential overheating, and maintain the correct electrical environment for the equipment.

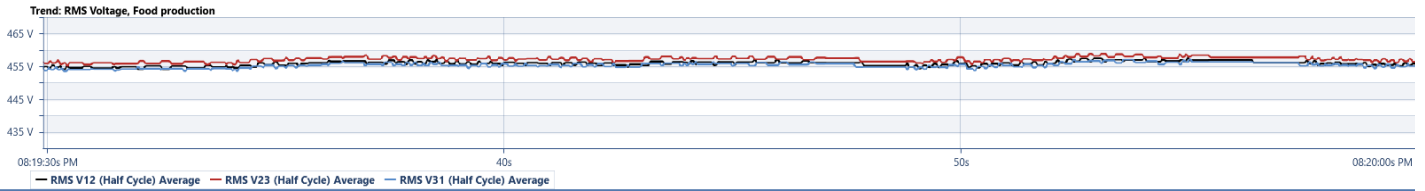


The Results

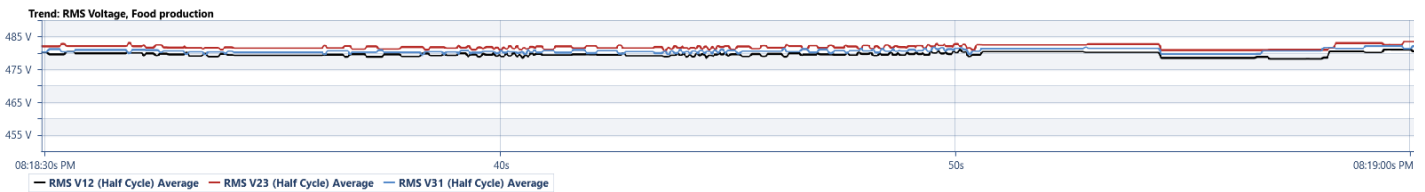
After the Equalizer was installed, power quality measurements, with the Equalizer on and off, were performed using Elspec's G4500 [portable PQ analyzer](#), equipped with continuous waveform recording. The graphs below show the measurements' results when the Equalizer is off vs. on.

Voltage levels: The average voltage level increased from 455V to 480V. The Equalizer system managed to stabilize the network and helped to prevent unexpected production stops.

Without the Equalizer

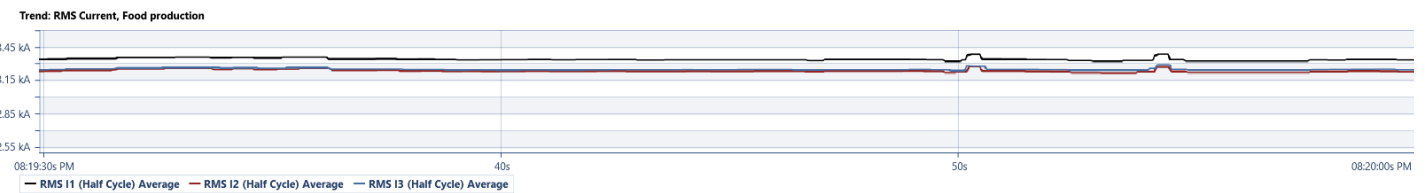


With the Equalizer

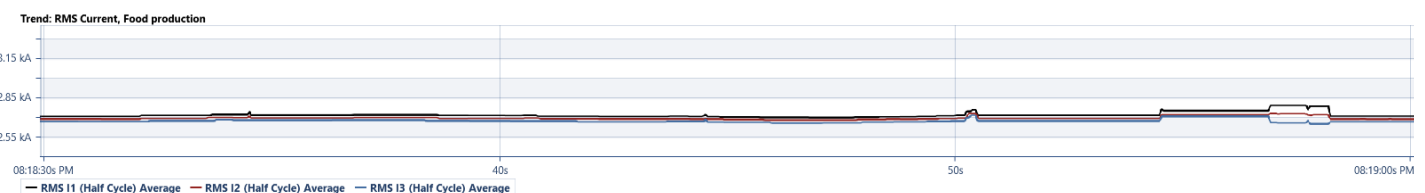


Current: The current waveform became much cleaner and stable with the Equalizer system, allowing the machines to work optimally.

Without the Equalizer

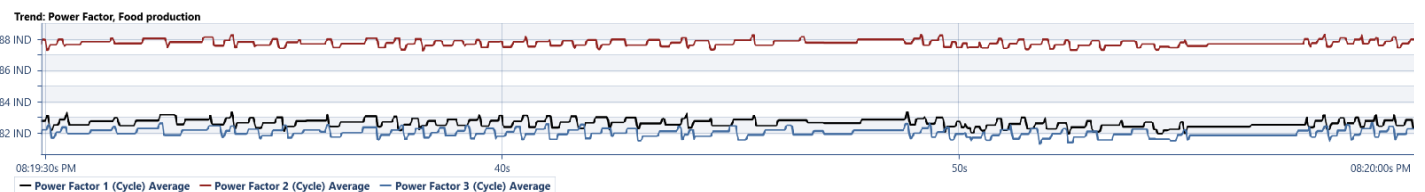


With the Equalizer

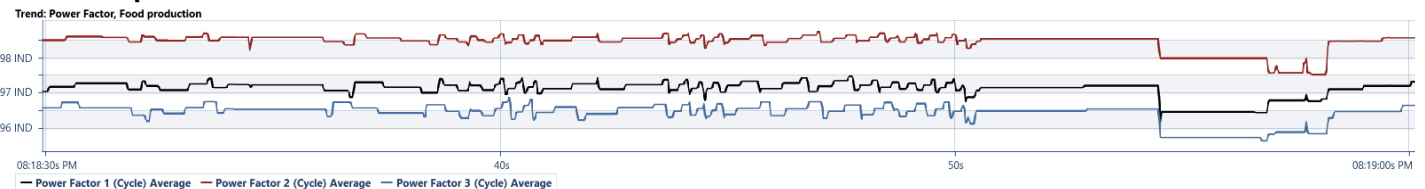


Power Factor: The Power Factor improved from average of 0.83IND to 0.97IND, placing the power factor values above the average value required by the national regulations.

Without the Equalizer

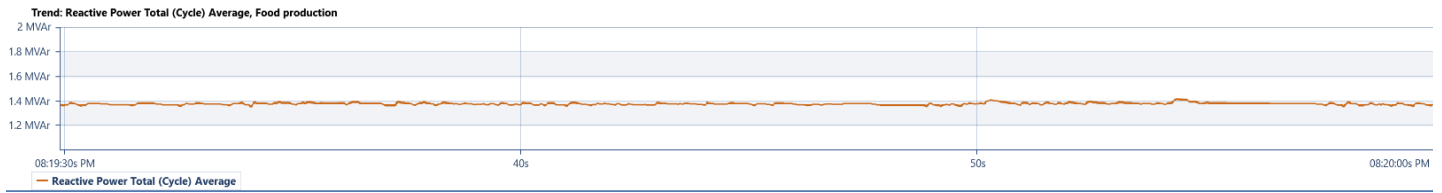


With the Equalizer

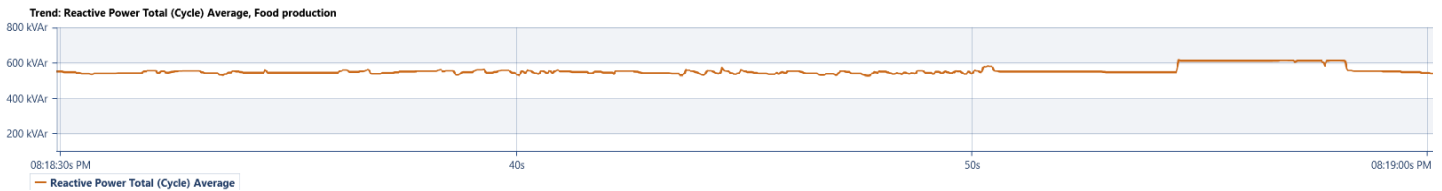


Reactive Power: A 49.6% reduction in the transformer's reactive power was achieved. From an average demand value of 1.39MVAR, reaching peak demand of 1.41MVAR to an average demand of 600kVAR, reaching peaks of no more than 800kVAR.

Without the Equalizer



With the Equalizer



As shown by the data, all targets were achieved: the voltage stabilized near 480V, the current and VARs reduced, and the Power Factor increased. The table below shows the data with and without the Equalizer for comparison.

Reading	Values		
	Without Equalizer	With Equalizer	Difference
Voltage	455V	480V	+25V
Current	3.3kA	2.8kA	- 500A
Real Power	2.2MW	2.2MW	0
Reactive Power	1.39MVAR	600kVAR	-790kVAR
Apparent Power	2.6MVA	2.3MVA	-300kVA
Power Factor	0.85	0.97	+0.12



Installing the Equalizer provided many key benefits such as:

1. Stabilized voltage at the rated voltage level
2. Reduced current
3. Reduced VARS
4. Improved power factor

Taking all these improvements into account, the production should be able to operate with increased runtime and reduce the wear on the equipment.



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