Case Study

Solving Voltage Dips, Equipment Failure and Electrical Disturbances in the Mild Steel Industry

Customer Situation

Meet Engineering, a leading manufacturer and exporter of Mild Steel Gratings, Structural Steel Sheds, Handrails, and Stairs in India experienced frequent Voltage dips at the main PCC point (11KV) during the time of weld shots. This caused equipment failure and disruptive electrical disturbances and tripping of neighboring manufacturing units' equipment, machines, and motors. As a result, GEB (Power Distribution Company) asked the customer to run operation during night time thus limiting the factory operations.

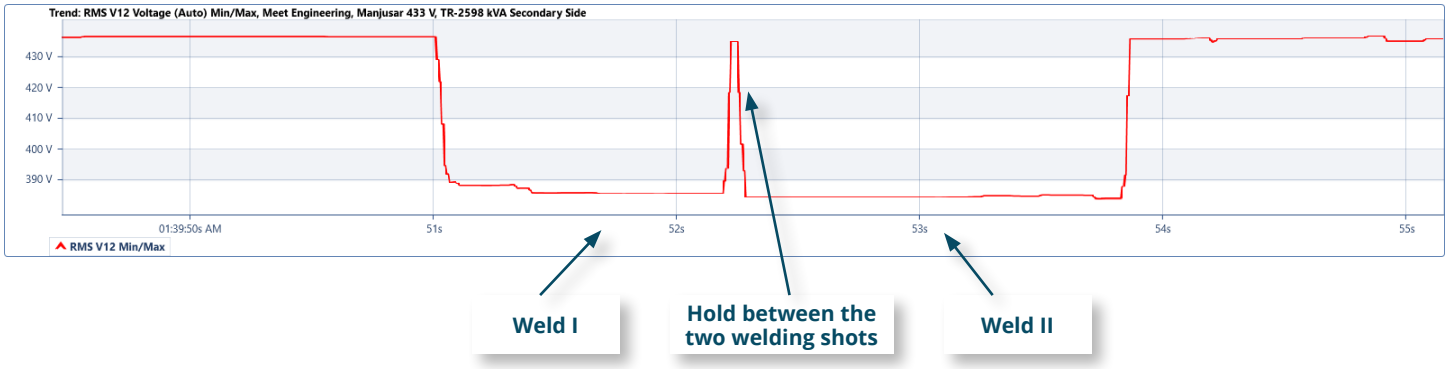
The machine in question draws power from a 2598kVA open delta transformer with a single-phase 433V L-L Output. Total machine welding cycle consists of two weld shots, referred to as weld1 and weld2, with a holding time of 70 milliseconds between each shot. Elspec's team in India monitored the power during this machine operation using Elspec G4500 continuous waveform recording power quality analyzer to record and analyze the data.

LV side (433V):

Voltage

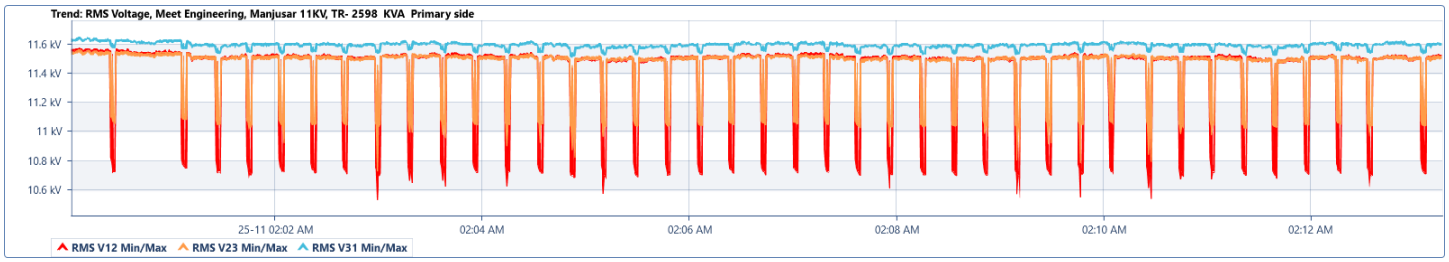
Current

LV Side Zoom-in: Consecutive welding cycles

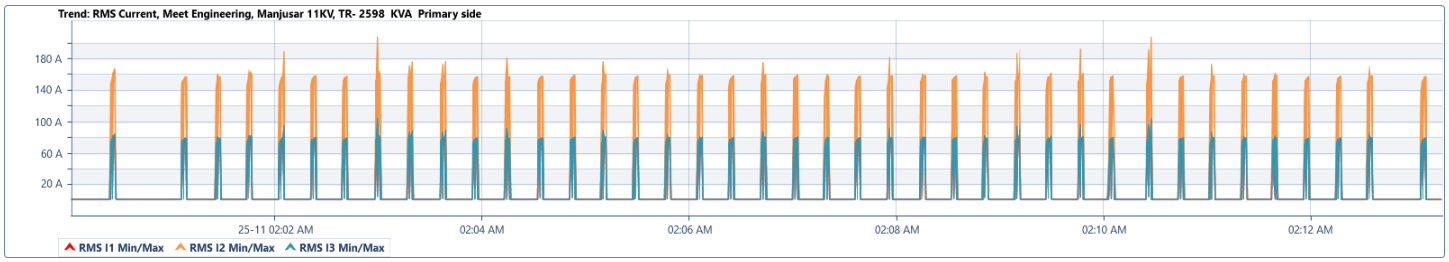


HV side (11kV):

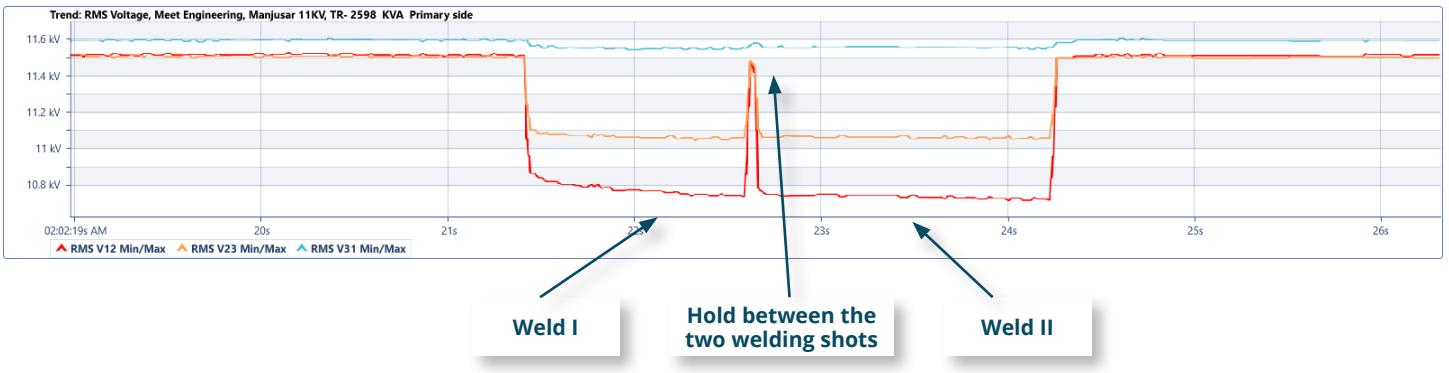
Voltage



Current



HV Side Zoom-in: Consecutive welding cycles



Solution

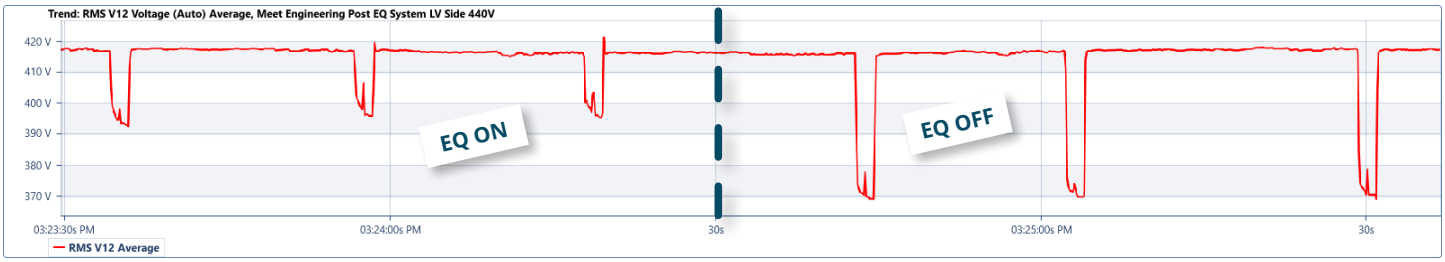
Elspec's 1260kVAr real-time reactive power compensation system – the Equalizer was installed in the production line. This is a transient free 9 groups & 9 steps of 14 kVAr system with 14% detuned reactor, for 440V/50Hz single phase L-L network, effectively reducing voltage drops caused by the welding shots.

Results

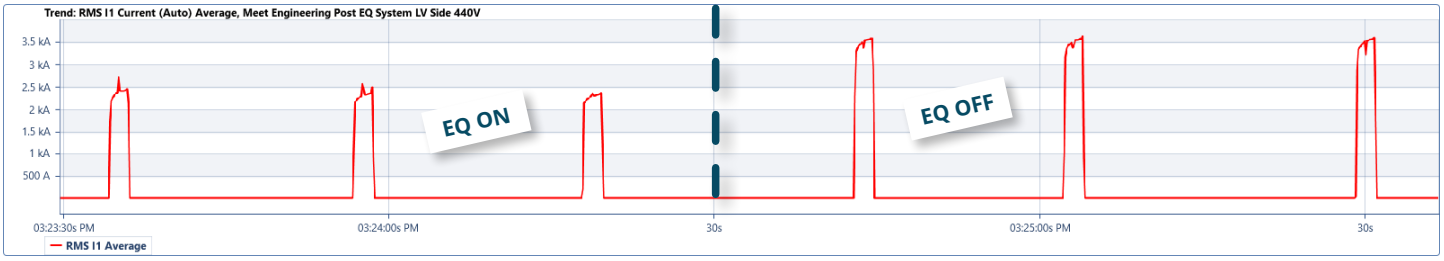
Data with and without the Equalizer showed the following results:

Performance LV side

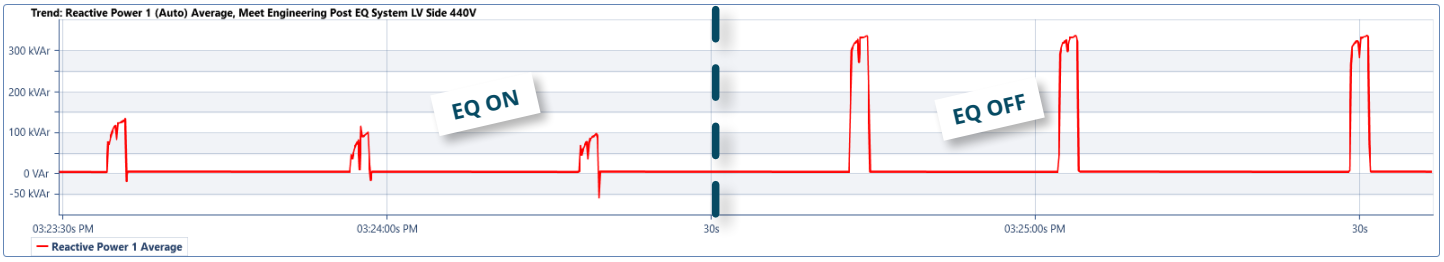
Voltage levels: The Equalizer system stabilized the voltage around 410V, reducing voltage dips in 58% from dips of 370V to 400V.



Current: Inrush current was reduced with the Equalizer system in 29% from 3500A to 2500A.



Reactive Power: 66% reduction in reactive power was achieved. From reaching peak demand of 300kVAr to reaching peaks of about 100kVAr.



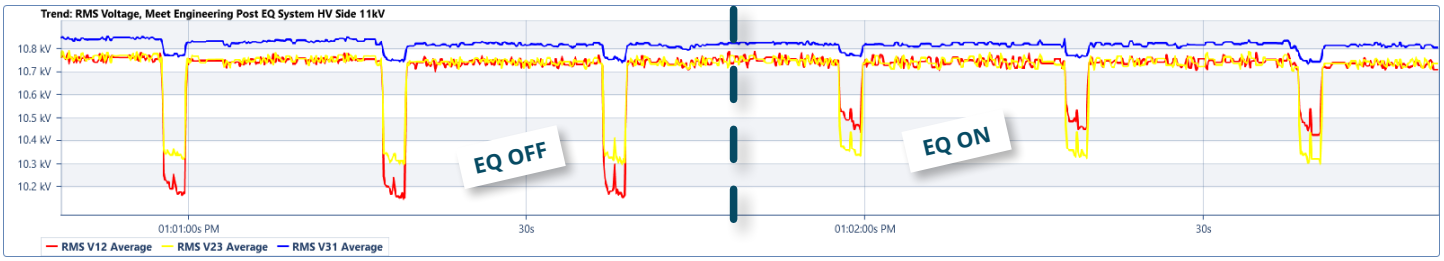
Power Factor: Significantly improved from 0.55IND to 0.95IND.

LV side 433V – Parameters Table

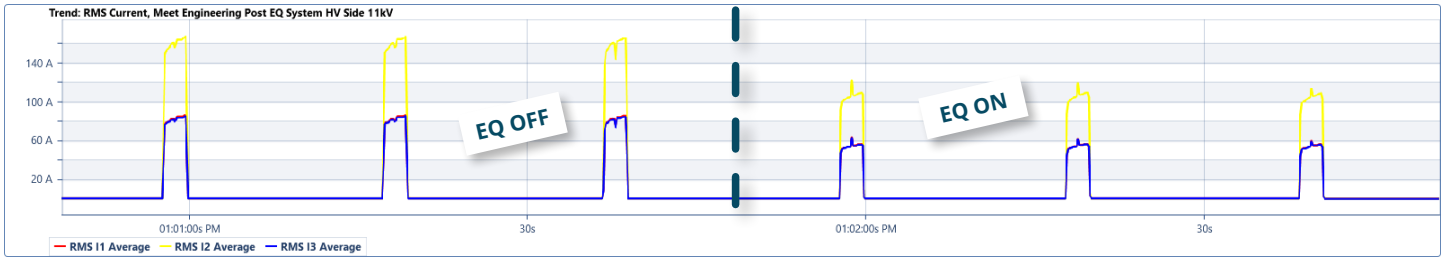
Parameter	EQ. off	EQ. on	Reduction with EQ system	Reduction with EQ system (%)
Voltage dip (V)	47	20	27	58%
Current (A)	3574	2552	1022	29%
Reactive power (KVAr)	1006	343	663	66%
Apparent power (KVA)	1200	925	275	23%
Power Factor	0.55 IND	0.95 IND	-	-

Performance HV side

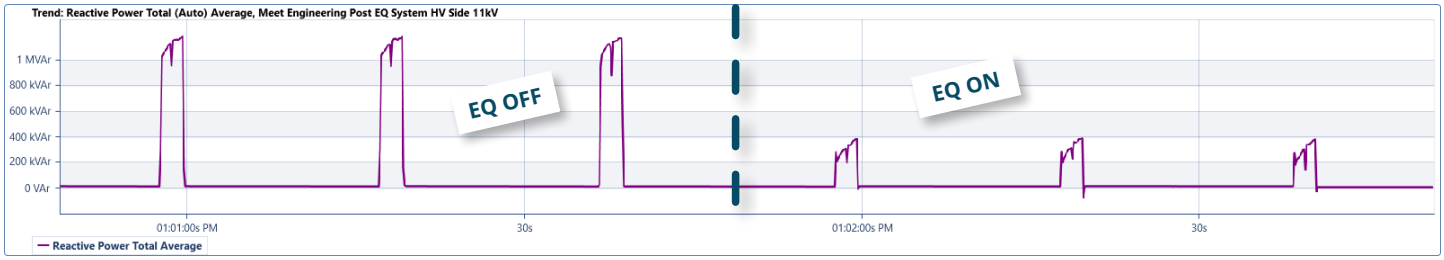
Voltage levels : The Equalizer system stabilized the voltage around 10.8kV, reducing voltage dips in about 550V (50%).



Current: Inrush current was reduced with the Equalizer system in 26%.



Reactive Power: 60% reduction in reactive power was achieved. From reaching peak demand of 1000kVAr to reaching peaks of about 400kVAr.



Power Factor: Significantly improved from 0.45IND to 0.82IND.

HV side 11 kV – Parameters Table

Parameter	EQ. off	EQ. on	Reduction with EQ system	Reduction with EQ system (%)
Voltage dip (V)	548	278	270	50%
Current (A)	167	123	44	26%
Reactive power (KVAr)	1183	400	783	66%
Apparent power (KVA)	1624	1180	444	27%
Power Factor	0.45 IND	0.82 IND	-	-

Conclusions

Installing the Equalizer system:
Improved current, voltage, Power Factor and reactive power.
Decreased equipment failure and downtimes.
Enabled the customer to run the plant 24x7 with substantial reduction in voltage dips by 50% @ 11KV.
Enabled to remove the Power Distribution Company restrictions, as disruptive electrical disturbances on neighboring manufacturing operations were eliminated.