



CASE STUDY

Elspec EQUALIZER Reduces Turkish State Railways Electricity Costs

The Turkish State Railways (TCDD) controls approximately 11,000 km of railways. Electricity is supplied through single phase 154kV. Substations use two 7.5MVA transformers, as seen in Figure 1, to reduce the voltage to 25kV. When a train reaches the substation network, the load rapidly increases then goes back to nearly zero when the train leaves. These megawatt changes occur in a tenth of a second.

Problem

The TCDD needed to achieve four main objectives:

- Increase capacity to allow more trains to run on the same railway segment simultaneously.
- Reduce voltage fluctuation instability caused by rapid load changes.
- Reduce/eliminate power factor penalties incurred for both leading and lagging limits.
- Reduce infrastructure (electricity generation and transportation) costs.

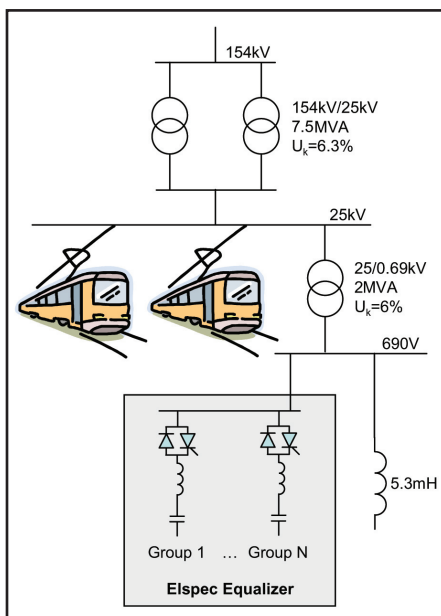


Figure 1: General System Diagram

The EQUALIZER Solution

The TCDD installed 25 single phase Elspec EQUALIZER systems, as seen in Figure 2. The nominal size of each system ranges from 1250kVar to 2750kVar, with a nominal voltage of 500V or 690V (line-to-ground). They are connected to the 25kV network using a step-up transformer. A parallel inductor is permanently connected to compensate the capacity of the long lines when there is no load.



Figure 2: EQUALIZER at TCDD

The first stage of the project consisted of the installation of six systems along the Istanbul to Ankara railway. It was only after this successful installation did the TCDD continue to the second stage with the installation of an additional 19 systems along four country-wide lines.

Figure 3 shows the EQUALIZER's performance at the Idealtepe Station, taken using Elspec's advanced software Power IQ, which allows remote system control and operation. When the EQUALIZER was switched into automatic mode, the total network current was reduced more than 50%, from approximately 7000A to 3000A.

The EQUALIZER achieved full network correction within a maximum compensation of one network cycle, resulting in unity power factor, improved power quality and increased energy savings. The TCDD was able to use a smaller transformer for the same load or increase the load on same substation (allowing more trains in the segment), together with enhanced network reliability.

In This Document

Read how the EQUALIZER:

- Increases network capacity
- Enhances network stability
- Eliminates power factor penalties
- Reduces infrastructure costs

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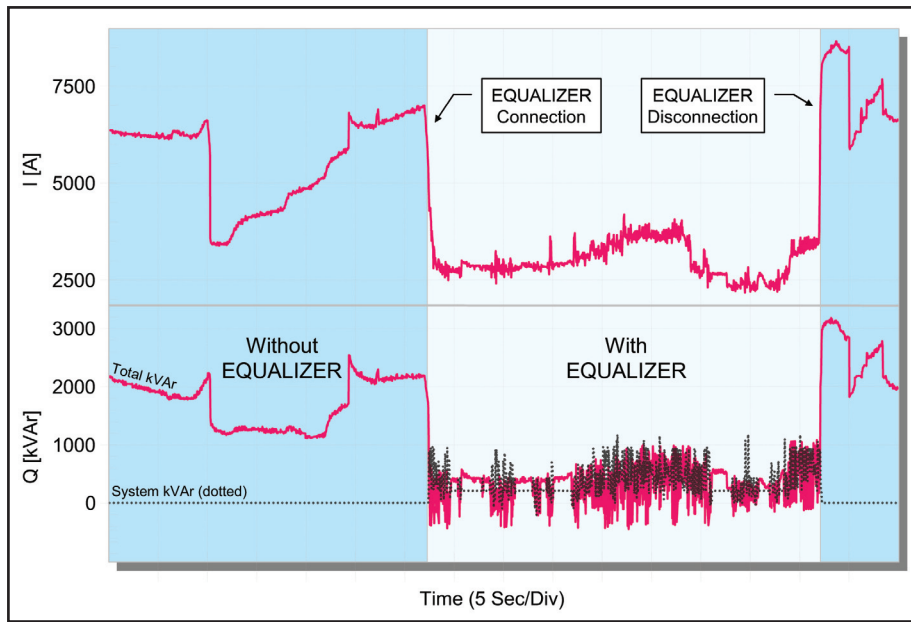


Figure 3: Idealtepe Station With and Without EQUALIZER

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