

Dynamic Var Compensation

An AccuSine Solution

Summary

Several types of loads, such as electric arc welders and arc furnaces, cause high levels of inrush current during their operating cycle, which is often only several seconds in duration. These high cycle-to-cycle currents cause the flux (magnetizing current) of the upstream transformer to saturate. Flux saturation causes the transformer output voltage to drop precipitously and results in failure or poor performance of the load.

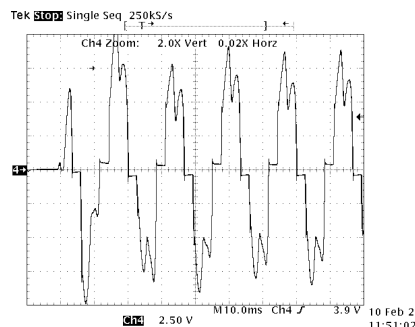
Additionally, when the above occurs, the source sees the voltage drop and attempts to provide the needed current to maintain the faulting transformer voltage, thus creating an additional component to the current surge within the electrical system. This current surge accentuates the voltage drop of the source on an intermittent basis. If the voltage cycling is repetitive, it might appear to humans as lighting flicker.

Key Benefits of Dynamic VAR Compensation

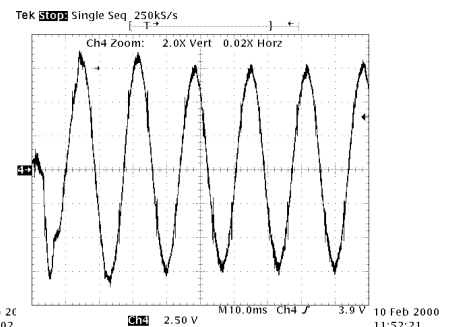
- Improvement of the quality of the output product
- Improvement of poor power factor
- Improvement of electrical system stability
- Correction of phase imbalances

How AccuSine® Works

AccuSine® is designed to inject current to support the current requirements of the load to reduce demands upon the upstream electrical system. With AccuSine® the system transformer does not see the massive demand for inrush current and does not experience flux saturation. Therefore, the voltage remains stable at the load and in the upstream electrical system. All of the primary problems, like flicker, are eliminated.



Current before AccuSine®



Current after AccuSine®

AccuSine® employs an analog current control algorithm for ultra rapid response. This permits AccuSine®'s instant-on feature to inject current during rapid load transitions, such as a first strike of an arc welder. It does not matter to AccuSine® whether this is a large harmonic or reactive load change. AccuSine® sees it through the current transducers monitoring the load and instantly responds by injecting as many cycles of peak injection current as required to support the load.

As a result of this instant-on system, AccuSine® maintains voltage levels, reduces voltage flicker, improves power factor, and improves product quality and employee performance and, thus, improves overall plant efficiency.

Special Application Notes

Electric Arc Welder

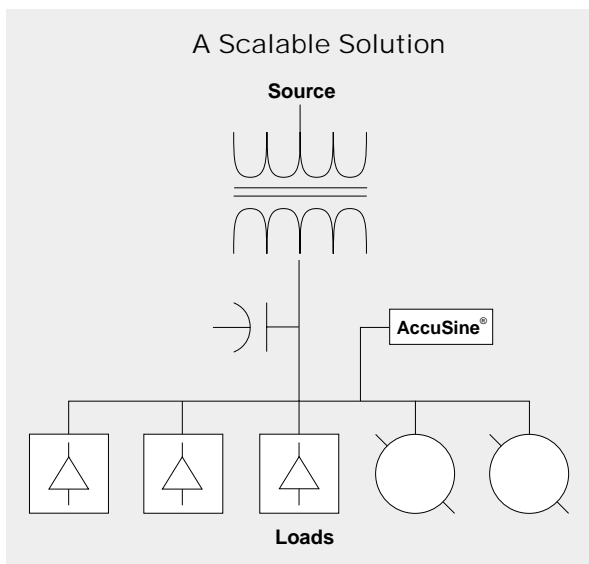
Electric arc welders operate intermittently for short intervals of time. When the weld is first struck, the welder requires essentially infinite current for a few cycles. During this period, the electrical system providing the power cannot provide all of the current demanded. The result is a voltage sag at the welder and a poor quality weld.

In an automated manufacturing plant, such as an automobile body plant, there are several welders on an electrical system fed from one power system. Simultaneous operation of multiple welders compounds the voltage sag problem and the incidence of poor product welds is greatly enlarged.

Effects of Harmonic current

Electric arc welders are unpredictable because of the cycle-to-cycle variation of the arc, especially upon first strike of the welder. This results in a difficult to define harmonic spectra. As the weld begins to flow, the harmonic spectra is more predictable with less amplitude of the peak current. However, the harmonic current still cannot be predicted.

This unpredictability, in addition to the very high cycle-to-cycle peak currents at first strike, make selection of a mitigation method extremely difficult.



Comparing Alternatives

Static VAR compensation

One method of mitigation employed is the static VAR compensator. This device employs fixed banks of power factor capacitors, controlled with thyristors which can switch them on and off rapidly. In many instances, there are also thyristor-switched inductors to prevent system resonance.

Static VAR compensation maintain voltage levels, reduce voltage flicker, improve power factor, correct phase imbalance and improve system stability. However, static VAR compensators are usually applied upstream of the system transformer, thus failing to correct the problem at the load and improving product quality. In addition, they are relatively slow compared to the welding phenomenon and thus not very effective.

Dynamic VAR compensation

A power correction system like AccuSine® is a smart solution for VAR compensation. It is a scalable bus-applied device that delivers flexibility in placement and precision control. The extraordinary speed of AccuSine® makes it an effective solution.

Remember, Dynamic VAR Compensation is just one of the benefits of a Power Correction System.

For more information, contact the Schneider Electric Power Quality Correction Group at (905) 459-8805 or pqc@squared.com or visit www.reactivar.com.