



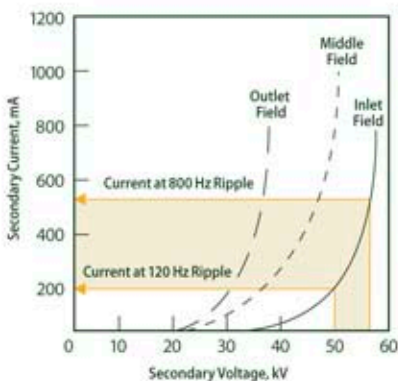
*Efficiency for*  
A CLEANER  
TOMORROW

Discussion of Mid  
Frequency Power  
Systems (MFPS)  
as Applied to  
Electrostatic  
Precipitators



## WHAT IS THIS WORKSHOP ABOUT?

It's about operating an ESP energization system at 400 Hz with a Mid Frequency Power Supply rather than the normal 60 Hz. Operating at 400 Hz reduces the TR ripple, allowing the average voltage to approach the peak voltage. Due to the steep nature of an ESP V-I curve, a relatively small increase in KV could result in a significant increase in current, and thus overall power. This additional power could mean the difference between failing or passing emissions testing or opacity limitations.



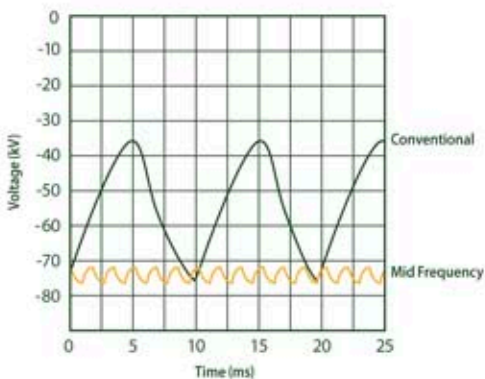
V-I curve showing improved current relative to reduced voltage ripple.



## WHERE CAN THE MID FREQUENCY POWER SUPPLY BE APPLIED?

Mid Frequency Power Supplies could benefit you if:

- TRs are operating significantly below rating.
- You are experiencing current suppression.
- You are experiencing excessive sparking.
- Naturally cooled oil filled Mid Frequency TR sets are preferred over force cooled units.
- You require more flexibility in your fuel switching program.
- You do not want to run new three phase power cables to the ESP roof.
- You want to run low cost tests at higher frequencies on your ESP.



Representation of Conventional and Mid Frequency secondary voltage waveforms.



New TRs are available as standalone or with integral mid frequency controls.



## HOW CAN A MID FREQUENCY POWER SUPPLY BE APPLIED TO YOUR PRECIPITATOR?

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### Retrofits

- The Redkoh system can be integrated to preserve existing communication and optimization systems
- With sufficient headroom between original design and present operating levels, and existing TR sets may be retained
- New TRs may be required if more power is expected than the existing TRs are capable of delivering

### New Precipitators or Rebuilds

- New TRs are available as a standalone or with integral mid frequency controls
- TRs have proven reliability and do not require cooling fans or the level of maintenance typically associated with the high frequency variety
- Mid frequency TRs are smaller and benefit those with space constraints

## WHEN CAN YOU APPLY THIS TECHNOLOGY?

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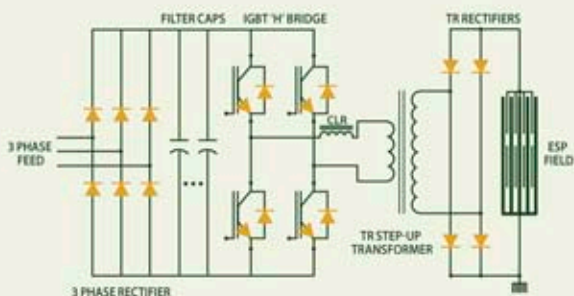
A site visit is required to evaluate the benefits of installing a Mid Frequency Power Supply. Both Paul and Dan are available to visit your site and discuss the application of this system.

“This additional power could mean the difference between failing or passing emissions testing or opacity limitations.”

## MID FREQUENCY POWER SYSTEMS

A single phase or three-phase AC main power source is fed into a rectifier and filter combination to create a relatively smooth DC power source. A three phase set-up is shown below. This DC source is then fed into an integrated gate bipolar transistor (IGBT) full wave bridge circuit where it is converted into a mid frequency AC waveform. The use of sub kilohertz frequencies may permit the use of the existing TR with its existing internal rectifiers and feedback signals. The value of the existing CLR for the conversion must be reviewed for possible modification. Typically lower CLR values are needed.

*The key is mid frequency power.*



IGBT full wave bridge circuit showing three phase feed being converted for use with single phase transformer rectifier.



## WHO ARE YOUR WORKSHOP LEADERS?

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**Paul Ford**

Paul Ford is the President of Redkoh Industries, a global leader in developing ESP controls since 1984. Headquartered in Hillsborough, NJ, Redkoh has pioneered innovative technology and manufactured ground-breaking products for customers all over the world.



**Dan Steinhaur**

Dan Steinhaur is the President of London, Ontario-based Stein Industries. Founded in 1992, Stein designs custom transformers and electrical power equipment for utilities and clients in heavy industry. The company has enjoyed steady growth since its initial conception, with an expanding product line and reach into exciting new sectors.





## THE BUZZ ON EFFICIENCY

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Efficiency is more than just a buzzword. If you work in an industry where pollution controls count, you understand that more efficient technology leads to greener performance. You also understand that the bottom line depends on getting the most from your entire system.

When it comes to powering your ESP, Redkoh Industries and Stein Industries take efficiency very seriously. That's why we're proud to introduce a faster, stronger, more efficient power supply that will make a difference for your operations.

*“This additional power could mean the difference between failing or passing emissions testing or opacity limitations.”*

## THE FUTURE STARTS TODAY

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If you're ready to make the switch to a higher power, Redkoh and Stein are ready to help. Contact us today for more information or to set up a consultation. Your new Mid Frequency Power Supply is just a phone call away!

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