


# Simulating Real World Metering Conditions

**Instructor: Dan Hollow - Rocky Mountain Regional Sales Manager**

**TESCO, The Eastern Specialty Company**

# Bio: Dan Hollow Rocky Mountain Regional Sales Manager for TESCO

Background in Micro Electronics. Have worked for TESCO as the Rocky Mountain Regional Sales Manager since 2015. Have worked in the utility industry since 1988. Began career in the utility industry as the Production Test Department Supervisor for Aptech and accepted an outside sales position with Aptech in 1992 and have been in outside sales ever since. Have also worked for companies such as UTS/Itron, Datamatic, and Metrum Technologies/Aclara.

Have worked in the technology industry since 1980 and have worked in other industries prior to working in the utility industry as an Electronics Technician and Test Department Supervisor for companies that manufactured products for Banking Equipment, Industrial CNC Controls, Process Controls and Flight Simulator Equipment.

# Course Outline

To subject Electric Meters to non-nominal conditions similar, to what meters would experience in the field as opposed to the nominal operating conditions typically seen by the meter during a meter accuracy test in a shop environment.

**Course Breakdown of Topics:**

- Subject the meter to Voltage Sags & Swells and observe the results on the meter in addition to the effect this may have on an AMR or AMI module that may be present in the meter.
- Subject the meter to Phase Angle Variances between the current and voltage both leading & lagging in addition to 180 degrees out of phase to represent Net Metering.
- Modify the Nominal Line Frequency of 60Hz from 45Hz to 65Hz and observe results.
- Dropping a Phase of Current for any given phase to simulate a CT with an open secondary or an open wire between the CT and the meter socket.
- Introducing Harmonics onto the fundamental 60Hz waveform and observe the results.
- Apply Back Voltage on the load side of a meter with an under-glass service disconnect switch to simulate a backup generator or cheater cord from an adjacent home.

# Simulating Voltage Sags & Swells

- Set voltage to 5 volts lower than nominal voltage for the meter to simulate a voltage sag
- Set voltage to 5 volts higher than nominal voltage to simulate a voltage swell
- Lower the voltage to the point at which the meter stops functioning properly simulating a brown out condition and verify that the meter and AMR/AMI recovers when the voltage is set back to nominal voltage conditions.
- Raise the voltage to the maximum voltage allowable based on the operating range of the power supply in the meter under test and observe the results.

# Varying the Phase Angle of the Current Relative to the Voltage

- Set the current phase angle to 60 degrees lagging e.g., .5 power factor
- Set the current phase angle to 60 degrees leading, 300 degrees
- Set the current phase angle to 180 degrees out of phase e.g., reverse current flow
- Set the current phase angle back to 0 degrees or unity power factor of 1

# Varying the Line Frequency

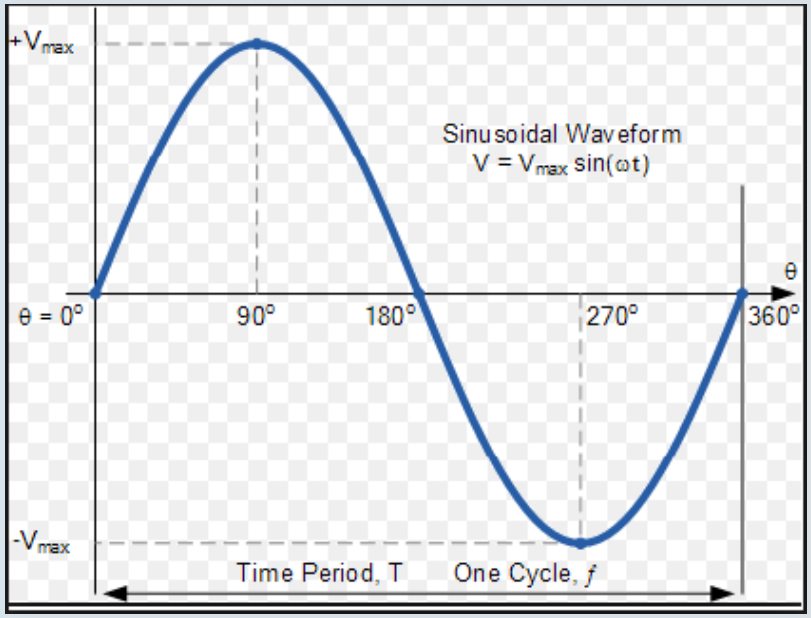
- Set the power frequency to 45Hz then verify that the meter sees the shift in the line frequency
- Set the power frequency to 65Hz then verify that the meter sees the shift in the line frequency
- Set the frequency back to 60Hz
- There should be no effect on the operation of the meter since most meters are designed to operate off of 50Hz or 60Hz

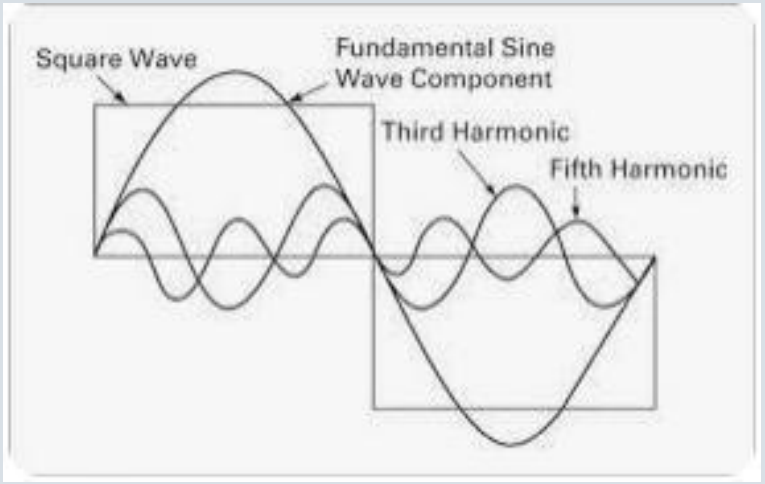
# Enabling and Disabling the Individual Phases of Current e.g., Single Element Test

- Disable the current for phase A and note the results seen by the meter
- Disable the current on phase B and note the results seen by the meter
- Disable the current on phase C and note the results seen by the meter
- Re-enable all three phases of current and set phase A at 180 degrees out of phase to simulate reversed CT secondary wires to the meter

# Introducing Harmonics onto the Fundamental 60Hz Waveform

- Introduce ANSI C12.20 waveforms to the 60Hz sine wave and note that the meter recognizes the harmonics and note if there is any adverse reaction by the meter or any AMR/AMI module's ability to communicate



# Appling Back Voltage on the load side of a meter with an under-glass service disconnect switch and attempting to close the switch contacts

- Open the contacts in the internal service disconnect switch in the meter
- Apply back voltage to the load side of the meter
- Attempt to close the contacts on the disconnect switch and observe results, the disconnect switch should not close back in

# Wrap Up/Review

- Why is it important to expose a meter to adverse/real world conditions in a shop environment?
- One reason is to test the meter program to make sure it logs events like voltage Sags & Swells, Poor Power Factor, and the presence of harmonics e.g., THD threshold exceeded
- To confirm that the threshold set for what constitutes as a back voltage is set to the desired level
- Verify that the meter logs a loss of a phase or a reversed phase
- Verify that the basic operation of the meter and or AMR/AMI module are not adversely affected by real world conditions

# Questions?

# 3 Quiz Questions Multiple Choice

## Simulating Real World Metering Conditions Questions

1. **Why would you want to simulate real world conditions for a meter in the meter shop?**
   a. **To watch the meter melt down.**
   b. **To see if the meter's real time clock would speed up or slow down.**
   c. **To see if the meter or AMI module would report errors or fail entirely.**
   d. **To verify the meter's accuracy.**
2. **Why would you want to set the current 180 degrees out of phase from the voltage?**
   a. **To perform a power factor test on the meter**
   b. **To see if the meter would power down.**
   c. **To see if the meter would stop registering energy.**
   d. **To see if the meter would register received energy.**
3. **Why would you want to subject the meter to harmonics in the shop?**
   a. **To recreate conditions found in the field at a given site to see if the meter or AMI module is adversely affected.**
   b. **Make the meter stop registering energy.**
   c. **To burn up the power supply in the meter.**
   d. **To see if the real time clock in the meter would run faster or slower**

Thank you.

If you have additional questions, do not hesitate to call or email us.

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