

ECE 528 – Understanding Power Quality

<http://www.ece.uidaho.edu/ee/power/ECE528/>

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Today...

- HW7 and Final questions/clarifications
- Power quality instruments and analyzers
 - Permanent recorders
- Parting comments

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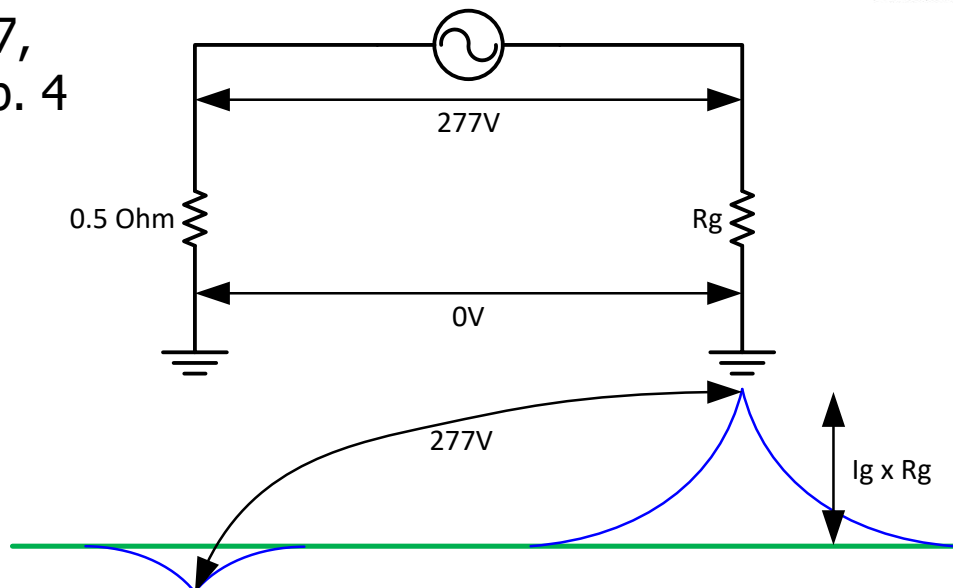
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Homework 7, problem 4

- Voltage to determine I_g
- Voltage across the ground rod for touch voltage

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HW7,
prob. 4

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Final questions?

- If not now, email.

Permanent recorders

- Recorders can be installed permanently as stand-alone devices or incorporated in revenue metering.
- Permanent recorders provide continuous, year-round monitoring of the power system at multiple locations
- Data is automatically uploaded to a server and can be viewed via the network or internet.

Deciding what to record and where - Reasons to record:

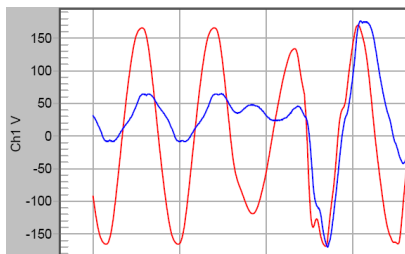
- Characterize system performance
 - Determine typical voltages, THD, harmonic content, daily energy profile, etc.
 - Quantify sags, interruptions and outages
 - Collect “pre-change” data to help analyze system modifications
 - Identify pre-failure symptoms

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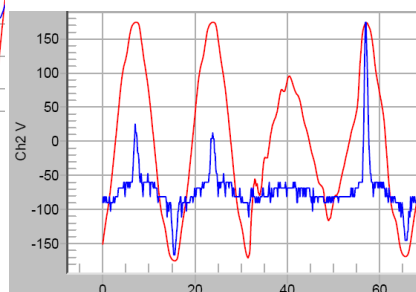
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Identifying pre-failure symptoms or other conditions requiring attention

Known tap-changer malfunction



Recently recorded event



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Reasons to record:

- Characterizing specific problems
 - Monitoring in specific locations to determine if equipment problems correlate with electrical system disturbances
 - Monitoring during the operation of suspect devices under controlled conditions
 - Monitoring in multiple locations to determine the extent of some condition or disturbance

Reasons to record:

- Facility or site surveys
 - May involve multiple problems
 - Extended monitoring or deliberate testing to quantify equipment vulnerability – what causes a trip?
 - Monitors at the PCC can help determine if an event is internal or external to a facility
 - This can reduce troubleshooting time following process trips
 - Multiple recorders may be required

Some observations after 25+ years as an Engineer

- Give problems time
 - We cannot stop engineering. Our brains continue working on problems without us if we give them time and space. Many solutions are discovered when you think you are not actually working on that problem. In fact you were.
 - Start early – learn the questions
 - Revisit the problem periodically, working as long as you are making good progress
 - When you have the solution, “let the ink dry” and then check your work

What we sell

- Opinions
(Based on math, science, experiments, etc.)
- The value of opinions
 - Accuracy and basis
 - Your integrity
 - know the limits of your expertise and be clear about them
 - Your ability to communicate with people who have different technical backgrounds
 - NOT your credentials alone

Teach

- You do not need to know everything, to teach something
 - Tutor math, or engineering
 - Give presentations on electricity to elementary, middle, and high school students
 - Learn something and then immediately share it with coworkers
- You'll learn more
 - Preparing to teach
 - Learning different ways to explain and understand the concepts
- You'll get better at explaining technical topics to others
 - Better at communicating your opinions
 - More comfortable in presentations

Learn

- Formal study is only part of an engineer's education
 - Build stuff
 - Take things apart
 - Read technical articles, and not just in your field
 - Invite yourself
 - Ask people to teach you something

Collaborate

- Get input from others
 - Different backgrounds bring different perspectives
 - Do not rely on just the more experienced people
- Share ideas
 - Ask to be part of projects you want to learn about
 - Have a question after reading a technical paper? – email the author

A few helpful principles

1. Don't assume that what you see is all there is to see, in anyone. People who "have it all together", are usually just good at making it look like they have it all together.
2. Things work out. Maybe not the way you hoped they would but they do work out. To see how, you have to keep showing up. "Remember that sometimes not getting what you want is a wonderful stroke of luck." - *Dalai Lama XIV*
3. Don't "feed the funk". We perpetuate bad moods by reminding ourselves why we're in them. Don't. Instead, get out and do something you normally enjoy, even if you don't feel like it at the moment.
4. Motivation follows movement. If you wait until you feel motivated to go do something, you're less likely to do it. Instead, just start. Once you're moving, the motivation to keep going will come.
5. Life isn't fair. Instead, the deck is stacked in your favor.
6. Give something no one else can give; your time.

Thank you.

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