FALL 2005

KTR ENGINEERING SOLUTIONS

INSIDE THIS ISSUE:

ABOUT THIS NEWSLETTER...

We hope you enjoy this initial issue of "Engineering Solutions" and look forward to your feedback. Our idea for the newsletter is twofold: provide insight on a particular engineering topic, and provide some amusement along the way.

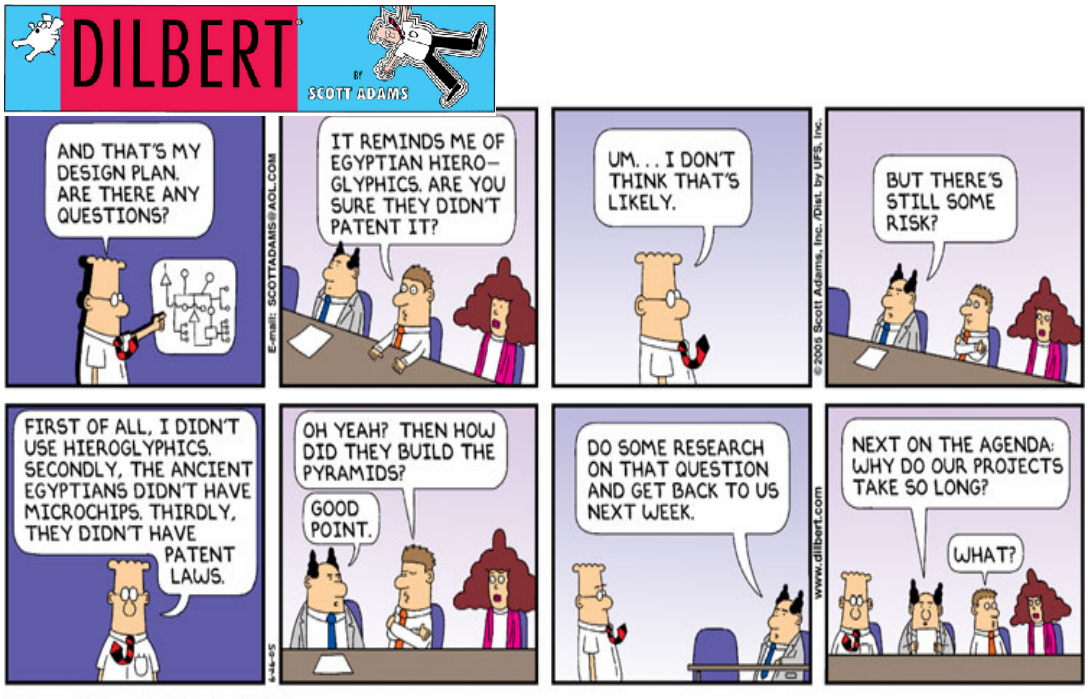
We feel we're "pretty knowledgeable" in a few fields and we'll try to exploit these areas in our "Technical Corner". We also have a "Ask Us Anything" section where someone has asked us about a particular subject or topic. So go ahead...Ask us Anything. We'll try to answer it.

One of our clients provided us with our first request: Their motor has failed due to a ground on their electric system. How can a motor fail when no ground current flows on a delta connected electric system? We're glad they asked. It also provided us a topic for the first "Technical Corner".

Again, enjoy the newsletter...let us know what you think.

SPECIAL POINTS OF INTEREST:

- KTR specializes in electrical, mechanical, and structural engineering.
- Industrial systems use ungrounded or resistant grounded systems.
- Many people don't realize the National Electric Code is NFPA 70 standard.



TECHNICAL CORNER— SYSTEM GROUNDING METHODS

There are multiple methods for neutral grounding for electrical systems. Common applications include solidly grounded, resistance grounded, reactance grounded or even ungrounded systems. Determining which grounding system to use for industrial applications typically falls into the ungrounded versus grounded electrical system. Most utility distribution systems use solidly grounded systems when feeding their customers (or effectively grounded systems...more on "effectively grounded systems" for another day).

The advantage of an ungrounded system in an industrial application is operational: For a ground fault on the system, the electrical system remains in service. Hence, this provides an economic benefit as the "process" remains online until it's deemed appropriate to de-energize the line.

The advantages for a grounded system include greater personnel safety, minimal excessive over voltages (stress) on the system as compared to an ungrounded system, and easier detection and location of ground faults when they do occur.

High resistance grounding is typically found on 600 volt systems and below, and resistors limit the ground fault current to 50 amps or less. Low resistance grounding is typically found on 5 to 15 kV circuits with ground fault current ranging from 50 amps to 500 amps.

Care must be exercised when sizing the resistor so that it allows a ground current greater than the capacitive to ground charging current as well as the ground fault current. Otherwise, your problem with transient over voltages will not be solved.

Where do you see a reactance grounded system? This system uses a reactor for its neutral connection. Typically, this system is used for generator applications where the ground fault current needs to be limited to less than the generator's three phase fault current capability. However, you do want significant ground current to flow, around 60% of three phase fault. Hence, a resistance connected system would not be appropriate.

> "A scientist can discover a new star, but he cannot make one. He would have to ask an engineer to do that." — *Gordon L. Glegg, American Engineer, 1969.*

ASK US ANYTHING

Question: "Our electrical system recently had a motor failure due to a ground fault on our delta connected electrical system. No excessive ground current was measured. How can a single phase to ground fault cause a problem on a delta circuit?"

Answer: Your delta connected system is in fact an "Ungrounded System". An ungrounded system has no physical connections between the conductors and earth ground. However, the system is grounded through the system capacitance to ground. See diagram on page 3.

A ground fault on one conductor results in full line-to-line voltage on the other two phases. This may cause the insulation to breakdown resulting in motor failure if this condition remains indefinitely.

HVAC JARGON PART 1

A Heating, Ventilating, and Air-Conditioning (HVAC) Control system operates the mechanical equipment (boilers, chillers, pumps, fans, etc.) to maintain the proper environment in a cost-effective manner. A proper environment is described with four variables: temperature, humidity, pressure and ventilation.

Temperature: The comfort zone for temperature is between 68°F and 75°F. Temperatures less than 68°F may cause some people to feel too cool. Temperatures greater than 78°F may cause some people to feel too warm. Of course, these values vary between people, regions and countries.

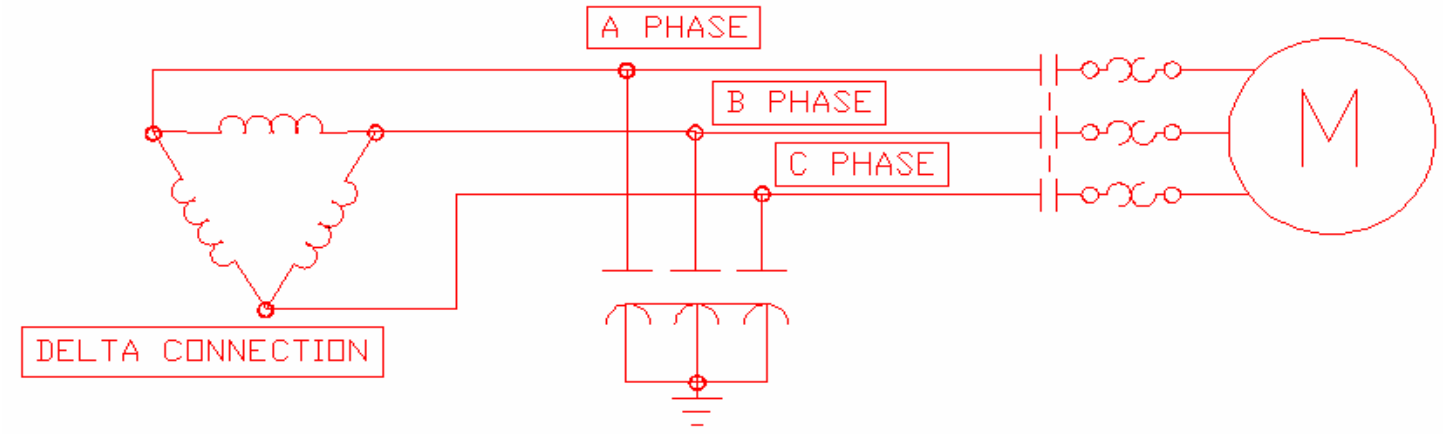
Humidity: The comfort zone for humidity is between 20% relative humidity (RH) and 60% RH. Humidity less than 20% RH causes the room to be too dry, which has an adverse effect on health, computers, printers, and many other items or devices. Humidity greater than 60% RH causes the room to be muggy and increases the likelihood of mildew problems.

Pressure: The rooms and buildings typically have a slightly positive pressure to reduce outside air infiltration. This helps in keeping the building clean.

Ventilation: Rooms typically have several complete air changes per hour. Indoor Air Quality (IAQ) is an important issue. The distribution pattern of the air entering room must keep people comfortable without feeling any drafts, and this is important as well.

Q: What is the difference between Mechanical Engineers and Civil Engineers?
A: Mechanical Engineers build weapons, Civil Engineers build targets.

ASK US ANYTHING, CONTINUED FROM PAGE 2



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