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The shocking truth about 'DIRTY POWER'

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It's already causing millions of pounds worth of damage to machinery and technology installations, destroying incalculable gigabytes of irreplaceable computer data and triggering hundreds of thousands of hours of expensive manufacturing and commercial downtime. It is, in fact, one of the electrical industry's most common problems. It's "dirty power".

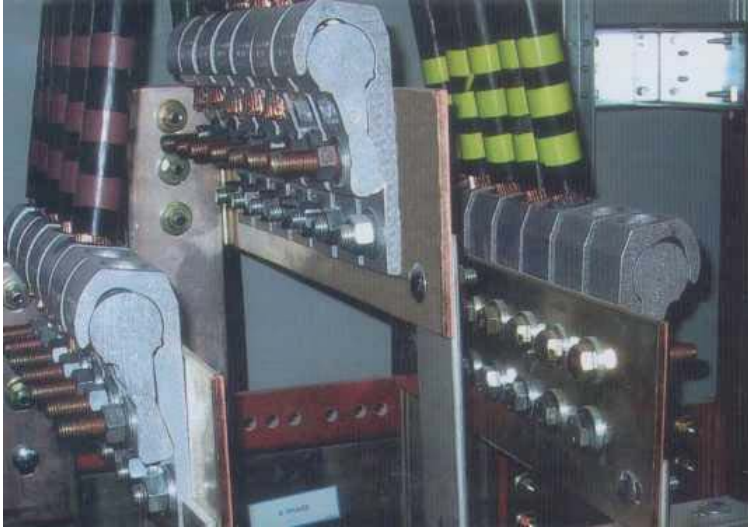
Dirty power is the industry term for a fluctuating or varying power supply that produces "spikes" and interruptions in the flow of electricity, causing damage to computers, networks, telecommunications and other critical electrical devices. Dirty power is a more common phenomenon than might be imagined. A recent IBM study of power sources in the United States showed that an average computer processor encounters around 128 power problems per month. In a typical business, more than

50% of computer, WAN, LAN or communications system problems can be traced to power disturbances. Spikes, surges, sags, harmonics, gaps, electrostatic and electromagnetic interference are believed to attack the overall electrical environment on an almost daily basis. Computers crash. Data gets corrupted or disappears. Machinery resets or locks up for no apparent reason. Relays, circuit boards and light bulbs burn out

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far too frequently. Audio systems hiss. Video systems flicker. Public address systems crackle. Fluorescent lights hum.

Some dirty power hits are a passing nuisance. Many are disastrous. In March 1999, crewmen at Florida Power & Light's



Golden Gate Service Centre reported that dirty power had shut down freezers in the local Publix supermarket causing an estimated \$1.5m in lost trade, spoiled stock and loss of goodwill. In October 2001, the Fort Myers News Press reported that 55,000 customers of Lee County Electric Co-operative had lost power for a period of six hours because of "connector failures" in their Iona Substation transformers. In the same month, a division of Southern Maryland Electric Co-operative reported a "catastrophic failure" due to breakdown of set-screw connectors in a distribution three-phase transformer.

Numerous assessments of the problem of dirty power have stated that 90% of electrical equipment failures can be traced back to connector or termination failures. In other words, an apparently insignificant part of the circuitry has the ability to bring the most elaborately designed system to a halt – usually at a critical time.

Much research has been conducted to identify the various causes of failure within the termination. The integrity of a connector can be affected by a number of factors, including the different rates of expansion and contraction of various materials used in its manufacture; the presence of continuous and sometimes intense vibration; the effects of creep or material cold flow; oxidation, electrochemical corrosion and thermal ageing.

There are three common methods of making power connections - all are well accepted within the industry but all exhibit specific problems.

The most common is the compression or crimp connector. This requires specially designed tooling to provide sufficient compression force to deform a tubular connector and crimp it onto a conductor. Installation is complex and error-prone, and while it offers significant improvements over the mechanical connector, it is likewise subject to thermal expansion, which can, and often does, result in thermal runaway. Most problematical, however, tools and dies are seldom if ever interchangeable, thus the correct tool is often not available. Tools also require periodic calibration and maintenance to conform to the relevant Quality Assurance procedures

Another method of providing a permanent connection is by using mechanical set-screw connectors, which have been used

with a degree of success for decades. Their most widely recognised failure however, is the backing out of the set-screw. The loose connection soon enters a thermal runaway condition, which eventually causes catastrophic failure of the connection. Many maintenance procedures recognise this problem and call for periodic retorquing of this type of connector, usually on a semi-annual basis.

A common method for making quality electrical connections within transformers is welding. The major problem with this type of joint is not so much its integrity as operator error. Welding, in most cases, is a manual operation requiring highly skilled technicians and weld reliability from day to day, and even weld to weld, is often questionable. The variation in resistance in multiple conductor welded connections is sometimes significant enough to cause imbalance in coils and thus reduce their intended design performance. Worker and installation safety is further cause for concern with this type of connection.

Around 15 years ago a new method of electrical termination known as "spring compression" was introduced. To confirm the integrity of the new processes and devices, lengthy testing has been required. Thus, in spite of the benefits of spring compression, its adoption by the industry has been relatively slow. Suffice to say that a barrage of testing, conducted on spring compression connectors by nearly every standards organisation on the planet, has proved the technology to be significantly superior in many instances to the existing popular methods. And the "proof of the pudding" is that many ageing 5 to 15 year old installations in Europe and the United States, in fields such as industrial facilities, OEM applications, power-generation facilities, power distribution authorities, marine applications, railway systems, petrochemical industry, mining and quarrying, have been equipped with spring compression connectors which are all still working safely and reliably.

The voices raised against dirty power and the old-fashioned connection methods in which it is rooted are growing daily in number and strength. The damage it causes, and its costs in both monetary and public relations terms, will be tolerated only for a short while longer. More and more people operating in the high-tech IT environment of the 21st century, are rejecting the "Dark Age" connections of the past and embracing this new technology.

End-user opinion is already spearheading the transition in the UK and enlightened installers must act quickly to catch the wave.

