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A large black cross graphic is centered in the upper right. The horizontal bar of the cross contains the word "design" in white lowercase letters on a red background, followed by "PLUS" in black uppercase letters on a white background.

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Facilities Engineering Associates has been publishing the **designPLUS Newsletter** quarterly for over five years with an emphasis on providing the mission critical community with insight into the engineering aspects of a mission critical facility design.

We have been involved in a number of projects with Stephen Newbold, AIA, and he has offered to contribute an article in this issue about the "human factors" in keeping a mission critical facility online. Steve brings a wealth of knowledge in the design of mission critical facilities with extensive experience in the architectural designing of broadcasting facilities. His experience has provided him with insight into how complex systems need to be managed across multiple departments and disciplines.

We hope you find this issue interesting and informative, and we encourage you to email us with suggestions for topics that you would be interested in seeing in the future.

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THE WORLD ECONOMY

by Leo P. Soucy, Jr., P.E.

Thomas Freidman ("The World Is Flat") discusses how the Internet and the proliferation of high-speed communications have completely revolutionized how companies operate. This has had a dramatic effect not only on outsourcing of high-tech operations (data processing, helpdesk, etc.), but also on "non-critical" operations including manufacturing, distribution, marketing and other functions.

Over the past few years, there has been a monumental shift in the way companies do business and there is not a single company that has not been affected by these realities. This has resulted in companies having to restructure themselves to meet the demands and cost constraints of the new world economy by implementing some of the following strategies:

- ▶ Relocating manufacturing overseas with only high value engineering and manufacturing remaining in the U.S.
- ▶ Redefining their corporate identity as marketers only, with all manufacturing outsourced to low cost, overseas manufacturers.
- ▶ Outsourcing of non-core activities.

Implementing these corporate strategies requires very different expertise as many processes are no longer local but require remote administrative capabilities. Whereas large corporations are

accustomed to integrating many remote operations, smaller companies are just beginning to implement these hybrid corporate models. Previously, procurement, scheduling, distribution and addressing problems on the manufacturing floor could be resolved by physical intervention. Now, the data center becomes the central link in the network that integrates all these different corporate functions.

We have found many companies have not sufficiently thought through this integration and are operating their entire enterprise on non-hardened data centers even though all functions including procurement, resource planning, distribution, accounting, payroll and point-of-sale data are resident on this equipment.

We recently performed a study for a financial company that was fully aware of dual corded computer processing equipment, mirroring, and full disaster recovery strategies; but their data center had N+0 redundancy and was not configured to support the company's business objectives. We know of other companies that have changed their corporate models to such an extent that it is necessary to build new facilities which will better accommodate their present business objectives. Surprisingly, many of these new facilities are being designed to reflect a new corporate image with little thought given to the hardening of the data center and other systems needed to support their highly integrated global enterprises.

STAFFING IN MISSION CRITICAL FACILITIES

FEA would like to thank Stephen Newbold of M. Arthur Gensler & Assoc., Inc. for contributing this article.

Facility engineering and systems design can anticipate only so much. The ultimate reliability of any facility comes down to the staff who runs it. It is their ability to effectively plan, maintain and respond which will determine the number of "9s" you achieve.

Mission critical facilities are a marriage of critical building systems and the supported business. The building systems are designed to be stable and reliable yet support a dynamic user and business environment. The staff has a similar role. The staff's primary mission is to maintain a "steady state" of power and services while the users and their activities follow business needs and are focused on other immediate goals. Often there is little coordination between the two parties co-existing under one roof. This "communication disconnect" can drastically effect the entire success of the facility when a problem arises which requires informed decision making based on a holistic view of everyone's interests. The two staffs have to work together to share the working knowledge of their respective responsibilities. Further, critical building engineering staff has to have access to and knowledge of all the systems in the building in an emergency. Ignorance leaves the building staff with few choices except the

most drastic which is a potential partial or full shut down.

Some factors to consider are:

- ▶ Mission critical facilities are increasingly automated and often run with skeleton staff, often without the most knowledgeable users present.
- ▶ With an increase in electronic systems, many user systems are left powered on and unattended (lab systems, testing equipment, TV studio systems, specialty environmental systems, etc.)
- ▶ The majority of operational change takes place during off hours when the full complement of building support staff is not present (systems upgrades, equipment change out, building system shutdowns, renovations, etc.).
- ▶ BMS and related systems may be in a remote central location and the monitoring staff lacks access to the full range of information available to the personnel on site (fire systems, discussions with responding emergency personnel, physical assessments-sounds, smells, etc.).
- ▶ Departmental divisions or security restrictions often hamper physical access to critical systems (electrical department closets, computer rooms with HVAC equipment, etc.) which can limit response time to situations which arise in the room, particularly when the after hours staff or emergency personnel are not fully acquainted with the facility or its operation.
- ▶ Fire Department procedures often follow standards established for non-critical facilities. Without intervention by knowledgeable on-site staff, the fire department's aggressive safety protocols may lead to unwanted consequences.

Here are some recommendations for consideration:

- ▶ Establish clear lines of contact and responsibility between building staff and users.
- ▶ Have users brief select building staff on the systems they use and which ones are automated or run unattended. Review effects of potential shutdowns- loss of refrigeration, loss of remote controls, limitations of users UPS capabilities, etc.
- ▶ Educate your fire department on your facility. Discuss with them the potential scenarios that are possible and learn what their procedures are.
- ▶ Run scenario role-plays with both building staff and users on what could happen to the facility. Invite senior management, security, consulting engineers and fire department staff to participate.
- ▶ Look for ways to limit risk during design of the facility. Ask these same questions prior to building a facility as you would to run an established one. Run scenarios and "role-plays" on paper with all the disciplines present to coordination of design and operation of the facility.
- ▶ Remember the basic day-to-day problems, which can cause major disruptions both to the facility and the staff. Pipe leaks, drainage back flows, roof leaks, storm damage to building, accidental sprinkler discharge, smoke conditions, wastebasket fire, computer failure, simple circuit breaker failure, and the "killer", deferred maintenance/system replacement. Remember, in an ideal world your facility would run without human intervention. In reality, it cannot run without it. Make sure the interven-

tion is the most informed and responsible possible as you will need it every day. Like a policeman's job, running a mission critical facility can be "boredom punctuated with moments of shear terror". Training, good communications, eyes wide open, a steady hand and team work go a long way.

CLEAN AGENT FIRE SUPPRESSION

by Marc Soucy

Halon clean agent fire suppression has been the preferred standard for data centers. During the 90's it was found that Halon contributed to the reduction of the ozone layer as it contained CFCs. Under the Clean Air Act of 1990, the production of new Halon has been virtually eliminated. Since the mid 90's the only Halon supply in this country was from recycled Halon or Halon that was produced before 1994. Due to this fact, there have been numerous other clean agents that have been developed to replace Halon for fire suppression, but three products which comply with the EPA's policy have emerged as the new industry standard. The three most widely accepted clean agents are Inergen, FM-200, and FE-13.

Inergen is a combination of three inert gases which are normally found in our atmosphere; nitrogen, argon, and carbon dioxide. These gases, when discharged into a space, reduce the amount of oxygen in the air to approximately 12.5 percent. The range of oxygen in the air needed for human safety and combustion is 10-15%. At this 12.5 percent

reduced oxygen level, Inergen prevents combustion but still allows people to safely breathe. Inergen is suitable for Class A, B, and C fires, is environmentally friendly, and leaves no residue.

FM-200 is a chemical compound of carbon, fluorine, and hydrogen, which was developed by the Great Lake's Chemical Corporation. It is suitable for Class A, B, and C fires. FM-200, when discharged into a space, essentially removes the heat from the fire and prevents the fire from sustaining itself. It is similar to Inergen and leaves no residue.

FE-13 (manufactured by DuPont) is similar to FM-200. When FE-13 is discharged into a room it acts under similar heat transfer principles as FM-200 by raising the total heat capacity of the space, absorbing heat from the fire, which in turn prevents combustion. FE-13 is very safe to be used in occupied spaces, can be used in high volumes to quickly extinguish large fires, and does not require extensive clean-up.

The real downside to the Halon replacement gases is that they are not as effective as Halon at extinguishing a fire. This means that more data center real estate must be dedicated for gas storage and discharge. This in conjunction with the high cost of the gas makes this an extremely expensive option for larger data centers. Due to this fact many data center managers are now returning to traditional means (i.e. wet sprinkler systems) for their fire protection needs. Some options to a traditional wet system include Single and/or Double-interlocked Preaction and Vesda (an early warning detection system), which make this option more attractive to IT managers.

FOOD FOR THOUGHT

Variable Computer Loads

Over the past few years, we have been hearing about new computer technology that varies the CPU clock speed depending on how much computing demand there is. Varying the clock speed results in variable power consumption.

While this technology has been around for a couple of years, it is just beginning to significantly influence the data center electrical load. You need to beware of this phenomenon when you design the power and air conditioning systems.

Policy
designPLUS Newsletter is published to keep the readers current with the latest trends in mission critical systems.

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