SCANFAX

April 2001
Volume 53, Issue 4

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A publication of the
Institute of Electrical & Electronics Engineers
— Chicago Section —

State of the Art Medical Center

The latest technology and concepts design Chicago's Northwestern Memorial Hospital

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- Student members and Associate members are not eligible to vote.

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- You may vote for only one candidate for each office.

We have several open positions and are looking for volunteers. Please help keep this organization strong by becoming involved as an IEEE Chicago Section officer or committee chair. We need you! For more information contact Ed Bogus at e.g.bogus@ieee.org or 847-259-9600, ext. 4738.

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- Enter your name, membership number, and mailing address in the space provided.
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The latest technology and concepts design Chicago's Northwestern Memorial Hospital

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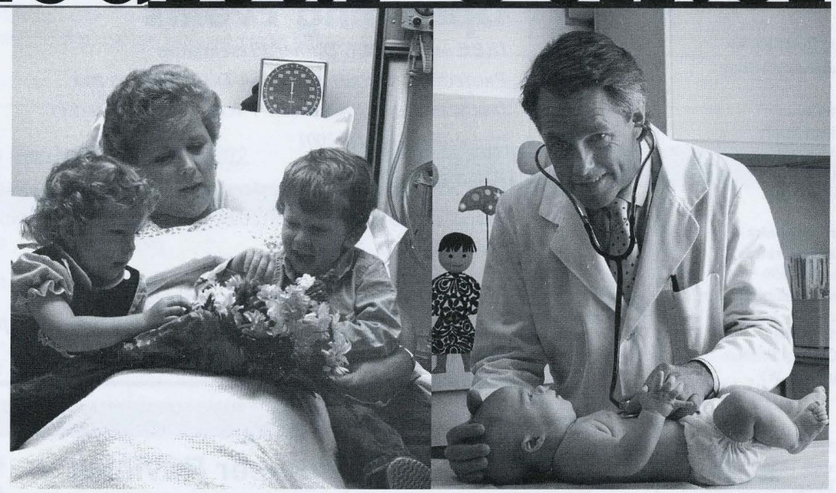

By Sandy Ryan

Northwestern Memorial Hospital (NMH) of Chicago was recently awarded the Illinois 2000 Outstanding Engineering Award in recognition of its facility redevelopment project. The completed facility features a computerized system designed to meter normal power distribution and monitor emergency power throughout a building made up of 10 million feet of electrical wiring, 23,000 electrical outlets, 40,000 light fixtures, 44 elevators and enough floor space to hold 44 football fields. Primary goals of the $580 million project included addressing future facility needs and providing cost-effective operation in order to improve convenience and quality for patients, physicians, employees and visitors. Combining facilities into one building allowed the hospital to eliminate service and system duplications found in the three existing separate locations.

NMH's Facilities Management Director Bud Vance said combining functions made it more efficient to operate the hospital and easier to serve patients.

"We wanted to include all the bells and whistles we could, including the technology of having almost an entire building on emergency power," Vance said. "Maintaining critical services is a major factor in designing the hospital's mechanical and electrical systems. The new facility features many system redundancies to ensure reliability."

System redundancies include keeping a spare boiler, diesel-powered emergency electrical generator, parallel supply and exhaust/return fans, chilled-water pumps and condenser-water pumps on hand to immediately replace out of service parts. Commonwealth Edison provides a dual source of electrical power and double-ended switchboards which are located throughout the hospital where either transformer can handle the load in an emergency.

Facility planning began as early as 1987 to maintain a 'patients first' commitment at the hospital. The Facility Management System (FMS) design goal was to incorporate emerging technologies not currently available but expected in the future. Ground was broken in 1994 and the facility opened to patients in May of 1999.

New construction architects were Ellerbe Becket and Hellmuth Obata and Kassabaoum. Power Contracting & Engineering Corporation and CRSS Constructors provided construction management services.

The new facility includes the 17-story Feinberg Pavilion for inpatient care with 492 private rooms and 92 intensive care beds and the 22-story Galter Pavilion for outpatient care and medical office space. An eight-floor diagnostic and therapeutic center connects the two pavilions.

The ambulatory care tower houses a new steam plant on the 22nd floor. Several locations for the steam plant were considered but the 22nd floor location came out on top as an economical site that provided greater reliability for hospital services. The site also avoided uncertainties attributed to long underground steam distribution systems.

Six separate contractors were hired to install mechanical, electrical and plumbing systems. The heating and cooling systems are completely integrated and controlled by a Johnson Metasys facilities management system. The system covers 20,000 points and is tied to all mechanical systems, the life safety system, the elevator system, security and the emergency power network.

The system can zoom in to mechanical equipment right down to the individual component level and is operated through a Windows computer program. Heat exchanger valves, level controls in the boilers and isolation dampers are the only mechanical equipment in the complex not DDC controlled. Boilers and chillers are started and stopped manually by engineering staff as a quality control measure.

An additional emergency power control Impac system is tied into the Johnson Metasys system to monitor and track critical emergency power.

"We have 87 different transfer switches," Vance said. "When we lose normal power or have a disruption, the transfer switches sense a voltage drop and transfer over to the emergency power. The Impac monitors the 87 transfer switches. It also has the capability of metering our normal power distribution and has the capability to monitor the entire system."

Newer technologies and design concepts included in the final FMS design include:

- Ethernet as the standard communication network between top-level digital controllers.
- Dedicated fiber-optic cables as the network medium between top-level digital controllers.
- A separate digital controller for each HVAC system, each fan side of the dual fan air handling units serving critical patient care areas and both supply and return airflows of each hospital zone.
- Electronic damper actuators for precise control of minimum outdoor ventilation air qualities.
- A data router to allow communication interface between the patient information system and the FMS to automatically support patient room airflow control.

Mechanical systems throughout the building and the nine mechanical rooms are operated and maintained by 42 engineers. Vance said the biggest project challenge was looking ahead to running a hospital with the highest level of technology in the country and finding people to run and maintain it. Operating engineers were hired 2 ½ years in advance of the project. Preparing a training program for each system began by organizing and categorizing a semi load of operating, training, parts lists and preventive maintenance manuals.

"There is a normal amount of shake down when you have a 2.2 million square foot building with miles and miles of wiring," Vance said. "Imagine trying to take a building of this size and labeling each electrical box to make sure they were accurate. We anticipated that and trained our employees ahead of time so that when we started using the buildings, they knew as much about the systems as the people who installed it. We certainly did not want to have any service disruptions that could affect patient care."

Even though the project involved years of preparation and training, Vance said the hard work and extra hours were rewarding.

"Surprisingly enough, we had a good time working on the project. It was like everyone in the group picked up on the fact that this was a once in a lifetime opportunity to be on the ground floor of a project that included the greatest and latest technology. It was a challenge to interface it all. Our biggest accomplishment was

having the training done ahead of time and when they handed us the keys, we were ready to go."

Technical Information

Heating

Five 600HP Superior fire-tube run-off natural gas boilers deliver the facility's heating capacity. Each has a 20,700-lbs/hour-steam capacity for a total of 103,000 lbs/hour. To serve the needs of the steam turbine chiller, the boilers run at 125 psi.

All five units can run on natural gas or #2 oil. Fuel for regular use is stored in a 60-gallon A-tank. An additional 25,000 gallons is stored in a separate tank as reserve for the emergency generator.

Cooling

The Evapco Cooling Tower features fiberglass blades, a stainless steel pan and delivers 7,000 tons of cooling. It is equipped with vibration motor switches, low-level oil detectors that send alarms to the FMS and an oversized capacity of up to 12,000 tons. Technically the unit is two 3-cell towers working in tandem, one for the north side and one for the south. The north half of the tower is outfitted with basin heaters for winter operations and its #1 fan also has a frequency drive for maintaining lower winter temperatures.

Four York Millennium Centrifugal Chillers work with the Evapco tower. The first chiller is a 1,000-ton, 480V winter unit. It uses 124A refrigerant. The next two chillers in line are 2,000-ton, 12,000V centrifugal chillers. The fourth chiller is a 2,000-ton steam turbine unit. It has an Elliot steam turbine on top and uses 125 psi steam to turn the turbine at 4,500 rpms. At full load it uses 24,000 lbs/hour.

The chilled water system connecting the above systems features a primary loop that circulates through the chillers while a secondary loop serves the coils for the air handlers, cools the linear accelerator, cools the Commonwealth Edison vault and provides cooling to the package units throughout the facility. Three 6,000-gpm Bell & Gossett frequency drive pumps serve the secondary loop and operate at 1,750 gpm for winter operations.

Emergency Power

Five 2-meg Caterpillar generators supply electricity and emergency power to the complex. Each of the generators has a 550-gallon day tank that feeds off the 25,000-gallon main tank. These generators are located in the first floor of the parking garage on site. They feature a parallel and switchgear system and can be started and stopped by the Johnson Metasys system. Eighty-five ATS switches are used by the generators, which also feature load optimization. In case of outage, they can run off of 2-3 generators based on the load required. Total capacity for all five generators is 10 million watts.

Air Handling

The entire complex is HEPA (high efficiency particulate air filter) filtered. There are a wide variety of fans throughout the complex ranging in size up to 120 HP. Dual feed air handlers come in to the main duct and feed 11 main supply fans. There are Joy Vanee-Actuator fans. These are dual fans so the actual number of fans is 22. The dual feed feature allows engineers to complete maintenance on half of the fans without interrupting service on non-extreme days. These fans have five stages: An Intake Plenum with primary and secondary filters; a preheat Coil; a humidification section (each half of every dual fan has its own dry steam humidification); a Chill Water Coil; and HEPA Filters (52 in each of all eleven dual fans.)

A Typical Mechanical Room

125 psi steam comes into mechanical rooms and is converted to 15 psi. Condensate receivers from machinery send to a receiver that sends to a de-aerator. Heat exchangers then take the 15 psi steam and heat a closed loop system, which sends steam through the building reheat boxes and radiant heat panels in rooms. VAV reheats are controlled by Titus boxes with Johnson Metasys controls.

Reco instantaneous "on demand" water heaters also take the 15 psi steam to heat incoming city water and provide domestic hot water to patient rooms as well as the rest of the hospital. They feature a recirculation line for unused water.

Technical information provided by Northwestern Memorial Hospital Facilities management and the project's mechanical and electrical engineer firm Environmental Systems Design, Inc. of Chicago. ■

EVENING MEETING

IEEE — IAS/PES Dinner Presentation

Protection of Primary Power Transformers for Industrial and Commercial Facilities Using Relays

Wednesday, April 18, 2001

Clifford Downs, ABB

About the Topic:
Industrial and commercial facilities face increasing demands to own and operate their own primary substation transformers rather than obtaining secondary power from utility furnished transformers. Numerous options exist for selecting primary protection on these transformers. Fuses, circuit breakers, and relays can all be applied to provide transformer primary protection from over-current and short circuit currents. This presentation will examine the use of relays to provide through fault protection on the primaries of Category I, II, and III liquid immersed transformers. The application of relays in coordination with circuit breakers will be reviewed. Instantaneous and time over current (50/51), ground fault (50/51N/G), and differential (87) relays will be highlighted. The discussion will include a brief review of transformer through fault protection curves and the contents of the IEEE Red and Buff Books.

About the Speaker:
Education: BSEE Drexel Institute of Technology
Present Position: ABB, Application Engineering Manager

Clifford Downs is the Application Engineering Manager for Distribution Relays for the ABB Substation Automation and Protection Division in Allentown PA. He is a member of the Power System Relaying Committee of the IEEE Power Engineering Society. He has over 25 years experience in the design and application of solid-state protective relays for medium and low voltage power systems. Cliff has a BSEE from Drexel Institute of Technology in Philadelphia.

NEW Location:
Note New Location! Meeting has moved!
COSTA'S (GREEKTOWN) 810 WEST VAN BUREN, Chicago.
Costa's is located in Greektown near Van Buren and Halsted.

Time:
5:30 PM Social
6:00 PM Dinner
7:00 PM Presentation

Reservations:
Your cost includes the presentation and a four-course dinner featuring roast lamb & grilled chicken combination platter. (Vegetarian or special dietary meals available upon request). Cost is $25 IEEE Member and $30 non-member. Valet parking is included with your meal. Please call the IEEE Business Office at (800)898-IEEE or (630)724-0200 with your reservation by April 10.

Note: For P.E. licenses that require continuing education for renewal, attendance at IEEE Technical Meetings is acceptable as one Professional Development Hour (PDH) per meeting.

The ED/CAS/SSC Chicago Chapter now has its own webpage at http://ewh.ieee.org/r4/chicago/ed-cas-ssc/. Check the page for details on chapter meetings and how to contact the chapter officers.

ED/CAS/SSC (Electron Devices/Circuits and Systems/Solid State Circuits)

CMOS Mixed-Signal/RF Integrated Systems - Trends and Challenges

Thursday, May 3, 2001

Professor David J. Allstot, University of Washington

About the Topic:
System-on-a-chip efforts are underway worldwide. With the continued scaling of CMOS technology, future integrated systems will comprise giga-gate communications processors and microprocessors in addition to mixed-signal interfaces to sensors/actuators and mixed-signal/RF interfaces to wireless networks. While prospects are limitless, future challenges are also daunting. Many key questions need to be addressed:

- How to design high-performance analog interfaces in ultra low-voltage scaled CMOS technologies?
- How to design low-voltage mixed-signal RF interfaces with very high manufacturing yields?
- How to design mixed-signal/RF subsystems that are immune to massive amounts of on-chip digital switching noise?
- How to efficiently test and debug extremely complex integrated systems?

Assuming that Moore's Law remains valid over the next two decades, this talk provides an overview of the system-on-a-chip CMOS integration challenges and outlines state-of-the-art solutions that hold promise for future implementations.

About the Speaker:
David J. Allstot received the BSES degree from the Univ. of Portland in 1969, the MSEE degree from Oregon State Univ. in 1974, and the PhD degree from the University of California at Berkeley in 1979. He has held industrial positions with Tektronix, MOSTEK, and Texas Instruments, and academic positions with Oregon State, Carnegie Mellon, and Arizona State Universities.

Location:
Motorola Schaumburg Campus
1301 Algonquin Road
Enter Campus using Gate A, westmost gate off Alqonquin Road, west of Meacham. Door 13 is under Motorola sign on west face of six story building. Preregistration is required.

Time:
6:30 PM Social (Free Sandwiches, Snacks, and Beverages)
7:00 PM Presentation

Reservations:
Please call the IEEE Message Center at (800)898-4333 or (630)724-0200 by 1PM Wednesday, May 3rd. For information, call Norm Phoenix at (847)523-1078.

IEEE Communications Society - Chicago Chapter

Quality of Service in IP Networks/Call for Paper and Participation

May 21-22, 2001

Theme: Eploiting Leading Edge Internet Network Tehnologies

About the Topic:
The emphasis of this educational event is on new approaches and trends in today's communication technology. This event intends to stimulate an environment to enable effective information exchange and learning among network professionals at service-providers and vendor organizations who need to stay up-to-date on the latest industry development. This educational event comprises a 4-hour tutorial session on "Quality of Service in IP Networks" and a symposium devoted to Internet telephony networks and services.

Tutorial:
"Quality of Service in IP Networks"
Presented by Dr. Grenville Armitage, Bell Laboratories, Lucent Technologies"Author of 'Quality of Service In IP Networks: Foundations for a Multi-Service Internet', Macmillan Technical Publishing"

Presentation Session Topics (divided in two categories) include but are not limited to the following:

I. Internet Telephony Networks:
Wireless IP Networks
Standards and Interoperability Issues
Quality of Service
Security and Network Reliability
Mobility Management

II. Internet Telephony Services:
Wireless Multimedia Services
Location Based Service
Billing Services
Network Management Services

Sponsors:
IEEE Communications Society - Chicago Chapter
Lucent Technologies - Bell Labs Innovations
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Motorola Inc.

Location:
University of Illinois at Chicago, Chicago, Illinois

Important Deadlines:
Abstract & Viewgraph Due: March 26, 2001
Notification of Acceptance: April 6, 2001
Full Presentation due: April 23, 2001
Presentation: May 21 & 22, 2001

Abstract/Presentation Viewgraph Submission:
Authors are requested submit abstract. Your abstract, 400-500 words, should be informative, containing (a) a title with author's names(s) and affiliation(s); (b) the presentation objective; (c) brief statements of methods; (d) a summary of the results and conclusions. Authors' presentation material need to be in viewgraph (landscape) format. Each presenter is allocated for 40 minutes for presentation including 5 minutes for Q&A. Paper is welcomed, but it is optional.

Information:
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REGISTRATION FORM

Please complete the following form to register for the 2001 Annual Educational Event to be held on May 21-22, 2001 at the University of Illinois at Chicago, Chicago, Illinois. Return the form either by e-mail to *ksmolik@lucent.com* or by US mail to Kenneth Smolik, Lucent Technologies, Room 2A-550, 263 Schuman Blvd., Naperville, IL 60566-7050. The registration fee is as follows: IEEE Member $295, Non-Member $395, and Student $125. The price includes materials, lunch, and tutorial.

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Payment: $395 (non-member) $295 (member) $125 (full-time student) *circle one*

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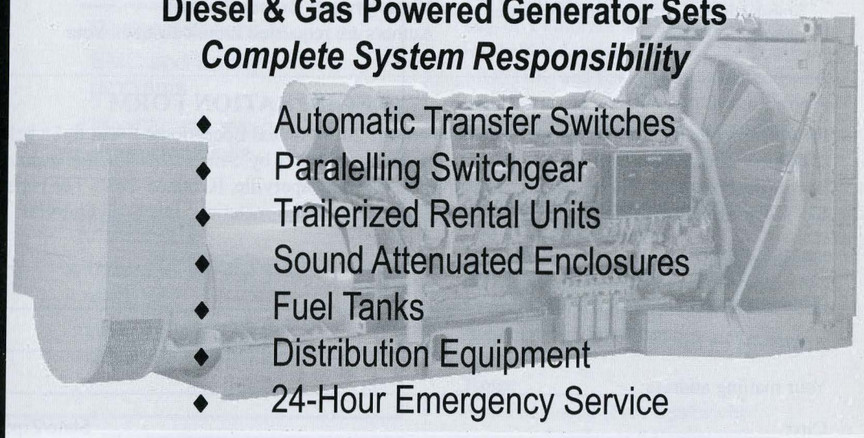

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