Society of Manufacturing Engineers

SEATTLE CHAPTER 39 BULLETIN

July 2001

Chairman's Message

The first half of the year has gone by fairly quickly and Chapter 39 had some quality meetings to go along with it. Picking up in April, On April 25th, there was a joint meeting with The Institute of Industrial Engineers, (IEE). The subject was "Simulation Today and Tomorrow" presented by Jaret Hauge and Kerrie Page from NovaSim.

In May, the big activity was the Annual Meeting held here in Seattle. The Lean Manufacturing program was interesting as I am sure the Six Sigma was. The other activities were interesting and I would like to thank the WWU student chapter for presenting their Westec project at the Resource Open House.

June , July, and August represent our annual break from activities as people go on vacation, etc. Possible activities in the Fall include a tour of ADIC in Redmond and a trip to Vancouver, B.C. to see a factory of Ballard Power Systems.

Last item. There are a ton of activities to be involved in with SME. If you are interested, please contact myself or any other of the chapter officers. The involvement activities run the gamut. From educating grades k thru 12 in engineering as a career field to setting up a meeting or just about anything else you can imagine.

Tim Bond
Chapter 39 Chair

MESSAGE FROM THE PRESIDENT

SME lives in a world of changing technologies. Our established markets and products grow older, and some of them get tired. New ones emerge to replace them. In many ways SME is like a primeval forest, in which new growth constantly replaces the old.

Like a forest, SME never remains static. It's a mixture of comings and goings; some quiet and some noisy, some orderly and calm, and some turbulent and confused. Nothing we do can enable us to avoid change, and the more successful SME becomes, the more rapid the pace of change.

We are free to select SME's pathways to the future. To map them we need only to know something of the journey we are undertaking, and to understand that our pursuit of excellence can never return us to our "good old days" at the forest's edge. SME has a proud heritage of early chapters, where small groups assembled to share ideas, and to pass on their lore and vocabulary to the field's neophytes. But then along came greater personal mobility, enhanced communications, and newer technologies, and SME's world changed. Where are we going now?

The SME Strategic Plan adopted by the Board of Directors during its meeting last November envisions a future in which SME is to become the most influential, respected manufacturing society on the planet. Can we do this thing? Yes! Shall we? Of course! Is it where our membership wants to go?

Well, at last year's Annual Meeting, volunteer leaders were asked to respond to this statement: "If SME were these things, then I'd be getting my money's worth for my dues, and I'd be proud to stay a member." What resonated most with this group were the statements:

- SME stands for excellence. All the things it does are at or approaching a "best-in-class" global standard, *and*

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- SME is a leader among engineering societies in its use of communications technology and the Web.

Our volunteer leadership clearly wants SME to succeed at the business of excellence.

These statements, with ideas I'll share in later editorials, suggest some of the changes coming for SME. More can be found in recent SME staffing changes, in building on recent increases in SME's membership base, and in enhanced development of member benefits—things like the new and popular Personal Productivity Library. As these successes multiply, SME will become a new sort of "knowledge management" enterprise, one to be envied and emulated by others.

I am interested in your reactions to this editorial, and want to know what's on your mind. Just drop me a line at SME Headquarters to let me know where you stand.

— Peter Z. Bulkeley, SME President, 2001

Seattle Chapter # 39 Welcomes the Following New Members

Scott J Berglin	Sarah C Earl
Kevin Bozichti	Timothy J Harlow
Rhonda Callender	Elizabeth W Kent
Lea E Cole	Michael S Lewis
John E Drenguis	Richard D Roberts

Manufacturing Challenge 2001 Trip Report

Western Washington University's student SME chapter participated in the Manufacturing Challenge, an SME sponsored student competition staged during the Westec Expo in LA, as part of our 2000/2001 activities. The circuit board manufacturing project we competed with was started in the fall of 2000 and completed for the competition March 27th, 2001. At Westec we faced tough competition from a number of other student project, and though we feel our project was successful in terms of completing our established goals and providing a great learning experience, we did not place in the top three.

Background

Last year, our chapter was able to take second place at the Manufacturing Challenge with an impressive student built V-8 engine. For this year's competition we felt that a circuit board manufacturing project would be a nice change of pace, and give an indication of the scope of our education here at Western. As indicated in our original abstract, the project utilized an Adept 1 robot to manufacture a series of circuit boards, including feeding the boards, picking and placing components, and soldering. The project was entirely based on students' ideas and innovation. We knew we wanted to assemble circuit boards, and designed a system and fixtures that would do it with the resources we had available to us. To my knowledge, a similar solution to picking and placing components does not exist.

Preparation for Westec

We started the project by brainstorming individually and in a group environment. Ideas were discussed and assessed for functionality and simplicity. Because of our limited resources, it took many design considerations to come up with something that was realistic to complete. As a result, our final design was very simple, but does the job fairly successfully. We divided into separate task forces while concurrently engineering the various parts and fixtures needed for the system. In the course of the

2001 OFFICERS – SME CHAPTER #39

Tim Bond – Chairman
Tom Kato – Chair-Elect (2001 Chair)
Mary Lynch – Treasurer
John Erickson - Secretary
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project, we had several students graduate, some withdraw from the team due to lack of available time, and an addition of new members interesting in participating.

As in most projects, things don't always go as you plan, and our dead line was approaching with much left to do. It became apparent that a detailed time schedule and serious commitments from students to specific tasks was necessary in order to complete the project on time. As a result, rather than a big group of students working on everything together, we ended up with a core of 6 students finishing the project in small task forces. The students were Kyle Kimball, Scott Luedke, Adam Schuehle, Thad Anderson, Mike Ehman, and Truls Finbraten.

By the time we presented the project at Westec, we had accomplished what we stated in the abstract for the competition. We had designed a circuit that controls a magnetic levitation device, created CNC machined circuit boards, built an automated manufacturing system that feeds circuit boards, places solder paste at strategic locations, picks and places components, and reflows the solder paste for a completed board. In addition we had created a simulation of the operation, showing how the system could be implemented in a real manufacturing environment, considering safety issues and training of operators.

Funding

We were able to use materials and tools from school to produce the various components of the system, but were dependent on funding from SME chapter 39 and Region 14, for a total of $2,216.52, to cover surface mount electronic components, travel and boarding for the trip to LA, and some presentation props. The funding made it possible for 5 students to present the project and enjoy the show at Westec.

The participating students were:

- Kyle Kimball
- Scott Luedke
- Adam Schuehle
- Thad Anderson
- Truls Finbraten

At the competition

When setting up for the competition at LA Convention Center, we realized that we needed a projector to get some visibility. At the booth next to us, a team of students and a professor from the defending champion, San Jose State, had a bright red hybrid sports car displayed. The team had designed the car, but components were mostly outsourced with a budget of several hundred thousand dollars. They had music blaring and attracted most of the attention. Their project was not entirely finished, but looked very impressive and sounded like it had a lot of potential. They received a well-deserved second place.

On our other side, a team from California Polytechnic University had designed and built aluminum wheels for their student organization racecar, using a spinning technique. Though their project was not as impressive looking as the red sports car, they were able to document their research well in a great presentation, and walked away with the grand prize. Other projects included a very complete and impressive electric drill project by students from Montana State University and a functional all terrain wheel chair project.

As it turned out, we were scheduled to present first at the day of the competition. We had made arrangements the night before to rent a projector for displaying our PowerPoint presentation, videos of the robot manufacturing circuit boards, and our simulation. However, the vendor did not keep to our agreed on plan, and half of our team was some-

where in LA tracking down the projector when we the judges stopped at our table. We were able to delay the presentation, but probably lost points in the competition as a result. It could only get better from there. We gave a good presentation, enjoyed the chance to talk to other students and professional about our project, and were able to see the rest of the Westec event. We felt that our project was competitive, but apparently it was not good enough to place.

After the award ceremony, we celebrated our achievement with a great dinner and a relaxing night at the hotel. Even though we did not place in the competition, we felt that we had designed an efficient system for low volume circuit board manufacturing, we had built it, and at least partially optimized it, by our deadline. As far as we were concerned, the project was a success, but left a taste for better placement in the competition next year.

Lessons learned

None of our team members had participated in the competition previously. As a result we had limited knowledge about what we would be facing at the competition and the process of getting there. Two of this year's team members, next year's Chair and Chair Elect, will be able to bring valuable knowledge to the 2002 Manufacturing Challenge. In addition, a Manufacturing Challenge database is in the works, where helpful information will be recorded and maintained by our SME students after each year's event. Knowing more about the Manufacturing Challenge environment, judging procedures, project management, and teamwork, will benefit future project teams.

If we could have brought a projector with us from home, it would have made a big difference in our Westec experience. The Engineering Technology Department owns several projectors, but was unwilling to allow such an expensive piece of equipment leave the state. We understand that these kinds of obstacles are part of life, and will do our best to keep them from interfering with future projects.

A specific lesson learned from our project would be to get serious commitments from students to specific tasks at an early stage. Though the project should benefit as many SME members as possible, the core group of students that are willing to commit early on will likely be the same group who will end up finishing the project behind schedule if firm management is not implemented. Another lesson that is reinforced in our project is that most tasks take longer to complete than is first estimated. We were able to finish the operation of the system and optimize for cycle time, but did not have time or resources to make a final change in the circuit board layout that would solve a quality issue, or spend enough time optimizing the soldering operation.

Suggested Changes To The Project

As mentioned above, several parts of the project could benefit from further optimization.

Board Layout

Some of the circuit board pads should be slightly adjusted for position. The present XY coordinates for layout were based on dimension given by the manufacturer of the SMD components we used. Due to slight tolerance changes, the assumptions we made did not match up as anticipated when we actually had the components in hand. By then, the circuit boards were already made. The current result is that bridging occurs during the soldering process.

Soldering

Our design utilizes a pneumatic solder syringe to distribute solder dots on the circuit-board pads prior to component placing. A robot output circuit varies the time a constant pressure is applied to the syringe, controlling the volume of solder paste at each location. This operation is by far the most time consuming of the 90-second total cycle time for a board. In trying to optimize cycle time for this operation while maintaining correct solder volumes; we increased the pressure, due to the pressure over time relationship. With higher pressures the solder consistency was not as good, resulting in bridging or weak solder joints. Further experimentation with optimized board layout and a variety of different size syringe needles would likely solve the problem.

Further experimentation would also benefit the solder reflow operation. As the last operation in our manufacturing sequence, a flow of heat is applied at the circuit board pads. Airflow is directed to the desired locations using a traditional reflow solder gun and a custom made ceramic-coated funnel functioning as a manifold. The operation takes place while solder dots are being place at a previous board in the assembly line, and its time is controlled by another robot output. We were unable to do in-depth testing of the solder joint quality, but anticipate that they would benefit from a higher exposure to heat. This could be higher heat, longer exposure, or a combination of the two.

In short, the project is unfinished as far as optimization for quality. The potential is there, with further optimization, to produce series of high quality circuit boards. If we had been able to do that by the competition, and could document positive test results with respect to continuity, joint strength and bridging, we would have received much higher recognition at Westec. However, we all had great experiences with the project, learned valuable experiences about project management, problem solving, concurrent engineering, and teamwork, and developed stronger friendships in the process. From our point of view, the project was a success.

Simulation Today and Tomorrow Presentation Highlights

Kerrie Paige and Jaret Hauge, NovaSim, LLC

We recently had the opportunity to share some of our experiences in the field of simulation with a joint meeting of the Puget Sound SME and IIE chapters. We want to thank the Harris Group for providing the meeting facilities, and the attendees for helping to create a very lively and enjoyable discussion.

The goal of the presentation was to provide some insight on both the current state and future trends in discrete event simulation. We talked briefly about the definition of discrete event simulation, and about its interesting history. In the past, simulation was considered a method of last resort – models were extremely difficult and time-consuming to develop, requiring extremely skilled and therefore expensive personnel. Moreover, it was not uncommon for projects to take 6 months to a year to complete, and cost in excess of several hundred thousand dollars.

Due to advances in user-interfaces, object oriented code, and computing power, the picture has improved enormously. Today, simulation can be completed in days or weeks, and within budgets in the low five figures, even for complex problems. Given that it is common for simulation projects to identify cost savings in the millions, simulation offers an excellent return on investment and is fea-

sible for a wide range of problems. It is now gaining wide acceptance across a variety of application areas including supply chain management, transportation networks, and the service industries.

In describing the current state of the art in simulation, we covered several case studies, including:

- A distribution network decision support model for a major paper manufacturer
- A capacity planning and production scheduling system for a producer of copper tube and fittings
- A tool to help reduce cycle times in the donor blood testing process for the American Red Cross
- A capacity planning application for several medical clinics

While the state of the art in simulation technology has come a long way in recent decades, we still have a long way to go. In the last section of our presentation, we discussed how we envision the industry taking shape in coming years. We tried to address three fundamental questions:

- Which direction will software tools and technology take?
- What skills will be required of simulationists in the future?
- What application areas will become most prevalent?

If we had to pick two overriding trends to mention as highlights, they would be the recent and expected advances in simulation optimization and dramatically increased support for interaction with complex data bases.

We have tried to summarize the major points of our presentation within a few paragraphs here. If you'd like more detail, you can find the complete set of slides at http://www.novasim.com/portfolio/presentations.html. While you're there, you may want to browse the rest of our site for additional information about discrete event simulation, including links to other simulation resources and interesting white papers.

Northrop Grumman Selected as 2000 CASA/ SME Industry LEAD Award Winner

Northrop Grumman Corporation's Integrated Systems Sector (ISS) has been selected as the 2000 winner of the Industry LEAD Award by the Computer and Automated Systems Association of the Society of Manufacturing Engineers (CASA / SME). The LEAD Award honors industry teams for their "**L**eadership and **E**xcellence in the **A**pplication and **D**evelopment" of enterprise-wide integrated manufacturing.

"Excellence, innovation, leadership — these are a few of the important attributes that the Society of Manufacturing Engineers helps foster and influence in the manufacturing industry worldwide," said Ralph D. Crosby, Jr., Northrop Grumman's Integrated Systems Sector President.

In the LEAD Award selection process, ISS was noted for excellence and innovation with its art-to-part integration, application of electronic initiatives for procurement, shared services, and high performance culture activities as part of implementing a lean enterprise system, especially in support functions or "beyond the shop floor" processes.

For a nomination form for the 2001 CASA LEAD Award, contact Debbie Clark, professional interests, at (313) 271-1500 ext. 1820.

New Self-Assessment Program for CEI

SME's Manufacturing Engineering Certification Institute announces its newest tool for manufacturing professionals: the Certified Enterprise Integrator Self-Assessment Program. Using this computer program, individuals can determine their own knowledge and skills prior to taking the exam to become a Certified Enterprise Integrator (CEI). This is the only certification aimed at integrating information flow within a manufacturing enterprise.

Similar to the actual examination, the computer-administered program has sample multiple choice questions in enterprise integration. It can be used with Windows 95 and 98-based software.

Topics covered by the actual CEI exam include:

- Customer
- People, teamwork, and organization
- Resources and responsibilities
- Business Processes
- Shared knowledge systems
- Manufacturing enterprise infrastructure

The CEI Self-Assessment Program is $39 ($29 for SME members). It can be purchased online and downloaded at www.sme.org, or ordered in disk format through SME Customer Service by phone: (800) 733-4763; by fax (313) 240-8252; or via e-mail at service@sme.org.

For additional information, contact Nancy Mauter at (313) 271-1500, ext. 1810. There's a sample of the new self-assessment program online. Check it out on the SME Certification home page at www.sme.org/certification.

Seeking Association Members to Serve on SME Association Boards

SME's Technical Associations are presently seeking interested active association members to serve on its advisory boards.

By serving as an advisor, you will assist the Society in identifying and disseminating up-to-date technology-specific information on the developments, applications, trends and methodologies in your area of manufacturing.

Advisor responsibility includes support of the Society's goals and mission, attendance of two advisory board meetings a year, representation at other SME-related meetings, and assistance in the recruitment/retention of members.

Advisory board members are needed for the Association for Forming and Fabricating Technologies of SME (AFFT/SME); Association for Finishing Processes of SME (AFP/SME); Computer and Automated Systems Association of SME (CASA/SME); Composites Manufacturing Association of SME (CMA/SME); Association for Electronics Manufacturing of SME (EM/SME); Machining Technology Association of SME (MTA/SME); Machine Vision Association of SME (MVA/SME); Plastics Molders and Manufacturers Association of SME (PMMA/SME); Rapid Prototyping Association of SME (RPA/SME); and Robotics International of SME (RI/SME).

Individuals interested in becoming a candidate for association advisory boards should forward biographical information to Angela English via e-mail: englang@sme.org; phone: (313) 271-1500, ext. 1823 or fax: (313) 240.8255.

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