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"If a picture is worth a thousand words, a rapid prototype is worth a thousand pictures."

COMMUNIQUE-SDSU

Volume 2, No. 3 **May-June 2003**

SDSU Students at Work!

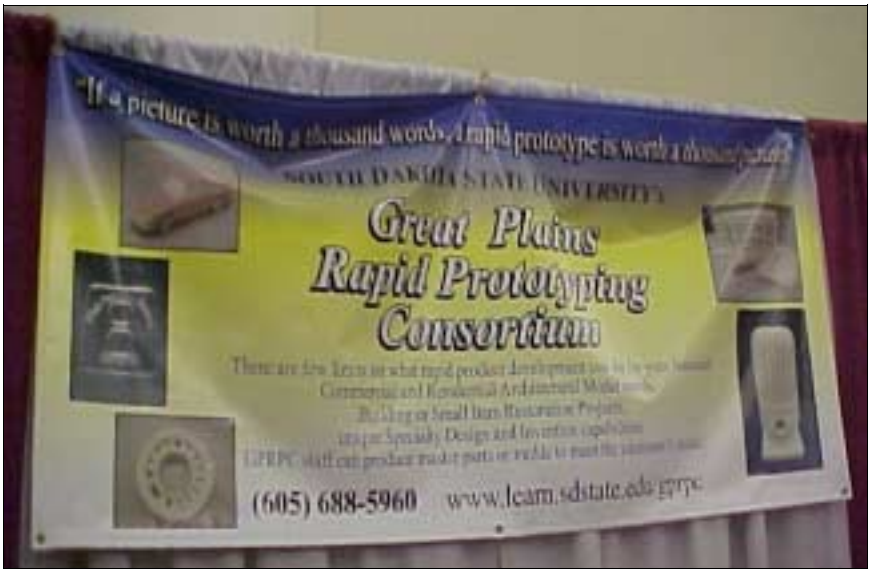
The College of Engineering utilizes undergraduate and graduate students to meet the vital needs of their organization including their grant-funded Great Plains *Rapid Prototyping* Consortium program. This student workforce is a valuable resource assisting SDSU, industry and the individual entrepreneurs to realize their goals through rapid prototyping advanced part reproduction and molding methods. **continued on Page 8**

GPRPC at the *Sioux Empire Home Builder's* Tradeshow

"This was our largest show ever. In fact, we can't get much bigger due to the size of the Convention Center," said Troy Gordon, PR Director for the Home Builder's Association (HBA) of the Sioux Empire.

"We had 210 booths and this was up from 180 at last year's show," said Gordon. 12,400 people attended this annual tradeshow event that was held March 13-16th at the Convention Center in Sioux Falls, SD. The next annual HBA Tradeshow is scheduled for March 4-7, 2004! The HBA of the **continued Page 7**

SOLBERG RENOVATIONS—Tracia Hogue cautiously walks in the dangerous cramped basement setting while giving a preview tour of GPRPC's new home… story continued on Page 3.



ABOVE: Sioux Empire mascot and entourage! LEFT: GPRPC's new banner made by Outlaw Graphics (Brookings) and created by T. Jensen.

Meet the Staff

Operations Manager
Jerry Visser

Program Manager
Carrie Steinlicht

Student Technicians:
Paul Stein

Graduate Research Assistants:
Rajesh Nagarajan
Davender Hooda
Brad Ruppert

Theresa Jensen
Writer/Editor
Photographer

The *GPRPC Communique* Newsletter is a bi-monthly publication. The viewpoints presented in this publication do not necessarily reflect the viewpoints of GPRPC.

Submissions are welcome and the deadline is the third Friday of each month.

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The Great Plains Rapid Prototyping facility mailing address and location:

Ron Reed Economic Development Center
2308 6th Street
Brookings, SD 57006

http://learn.sdstate.edu/gprpc

Call us to discuss your product requirements or to schedule a company or school tour:
(605) 688-5960

GPRPC's Support System

The College of Engineering has eight academic departments that offer undergraduate degrees in ten different disciplines, according to the SDSU website **www.sdstate.edu**

The Electronics Engineering Technology, Construction Management, and Manufacturing Engineering Technology programs are well served by the administrative support team of Ruth DeBoer, Barb Eyer, Lavonne Riechers, and Tracia Hogue. These four individuals provide valuable administrative support to GPRPC as well.

To find out more about SDSU, staff, and the diverse academic programs offered, please review their website. *

ABOVE RIGHT: Ruth DeBoer, Secretary of Engineering Tech Management, who began her SDSU employment in March, 1971. RIGHT: Barb Eyer, Program Assistant for the Engineering Dept., began working at SDSU 34 years ago. Eyer has been part of the Engineering Team for 17 years!

ABOVE: Lavonne Riechers, College of Engineering Secretary, began in 1987. RIGHT: Tracia Hogue, Engineering Tech Secretary, looks at material books for the new office areas. Hogue began in Aug, 2001.

GPRPC New Developments

"This project was unique because we used clear silicon which has not been used before," said Paul Stein, an Engineer Student/GPRPC employee, "and this clear material made it nice to see the bubbles and how the material flows when injecting urethane into the mold." This project proved more difficult due to the length and the middle, which had to be suspended to avoid collapsing.

"In the future, we'll look to do over-moldings on the molds themselves and not just on parts," said Stein, "for strength and durability." *

ABOVE: Stein is using a woodframe to suspend a silicon mold in the center to avoid collapsing. A clear material was used in making this mold of a GPS guidance enclosure for Raven Industries electronics division.

GPRPC Ready For Move to the New Solberg!

ABOVE: Hogue is a guide through the 3rd floor renovations, that started last Fall. Now, there seems to be some light at the end of the tunnel. BELOW: An unidentified Painters Duet are priming the Second Floor walls.

"MNET and the Administrative offices will be located on the First Floor. The EET and Construction Management will be on the Second Floor. Additional classrooms and the Engineering Graduate Assistants will be located on the Third Floor," said Tracia Hogue, an Engineer Tech Secretary and tour guide. By September 1st, GPRPC's new location will be in the renovated basement of Solberg.

The new lab will be used to develop 3-D prototypes for students educational opportunities and the industry partners. In addition, GPRPC clients will have parking available on campus.

The biggest benefit to the move "will be the immediate access to NC (numerical control) equipment in the Annex," said Jerry Visser, Ops Manager. "GPRPC can serve a wider type of prototype to include metal, which we cannot do from our present location."

Jerry Visser will continue as GPRPC's Ops Manager while teaching 3 classes: Plant Layout, Inventory Management and Operations Management. No rapid prototyping classes will be offered this next term. The classroom space will be utilized by other academic fields as well.*

LEFT: The future Engineering Dept's main office location and Dean Brown's office on 2nd Floor of the Solberg Building. RIGHT: Hogue shows where the new GPRPC facility will be located.

What's Up?!
At the Consortium

Congratulations!
To Travis Steen for his full-time engineer employment opportunity with Balance Systems Inc., in Sioux Falls, SD.
We will miss you!!!

Thank You's!
From the Consortium

To Becky Scholten:
for your participation and demonstrated excellent customer outreach skills at the Sioux Empire Home Trade Show.
Thank you!

To Paul Stein:
for making a new GPRPC display for future events and in the office.
Thank you!

To SDSU Print Crew:
for printing our newsletter and brochures upon a moments notice.
Thank you!

To Raven Industries:
For the company tour and a special *thanks* to Lonny and Dave for answer many questions.
Thank you!

To Ruth, Barb, Lavonne and Tracia:
For answering many questions and completing many administrative tasks.
From all of us at GPRPC...
A BIG Thank you!!!

Raven Ind

~ BES

"The customer wanted to change a few things," said Lonny Ackerman, Project Engineer. "Rapid prototyping is amazing, because we have parts back in a week or less. A very good turn around time due to GPRPC staff's work." That is how GPRPC rapid prototyping (RP) entered the company, that chose to offer financial support to the consortium at the Member level. "The deeper we get into 3-D solid modeling and as the product designs become more intricate, requiring better advanced surfacing, we'll use RP more, since it's an efficient method." New development applications include Ag, Marine, Aerial and D.O.T.

Raven Industries was founded in 1956, as a manufacturer of high-altitude balloons for NASA and the American space program. Today, Raven Industries produces products in Industrial, Recreation, Construction, Agricultural, Government and contract manufacturing. The company's three divisions include:

ABOVE: Lonny Ackerman, Project Engineer, shows the finished enclosure (Invicta 115) created by RP methods. Also, a urethane elastic gasket was used to solve a leakage problem and was made by GPRPC staff.

Engineered Films, plastic sheeting and flexible films; *Electronic Systems*, electronic assembly and testing services; and *Flow Controls*, including precision products for agriculture and D.O.T. applications. In addition, Raven has two subsidiaries producing specialty hot air balloons and outerwear.

Recently, Raven's precision, high-tech farm instruments leading the agricultural industry into the future were featured in the Business Section of the *Argus Leader*, the April 27th, 2003 edition. The company's diversity and innovative product developments have been successful in securing Raven as a powerful driving force in high-tech industry.

"The Basic system is a flow meter, valve, cable

ABOVE: Herb Starzl, Production Worker & 34-year employee holds the Aquatech Open Flow Valve. RIGHT: Open Flow Valve with a black heatsink attached to cool the unit.

LEFT: Dave Rohan, Production Engineer and a 9th year Raven employee, holds a stencil that begins the process to make the Printed Circuit Boards (PCB). CENTER: Kelly Stern, SMT Technician and an 8th year employee, enters the correct information into the computer to create the various PCBs, including the rate of production. RIGHT: Stern is seen adjusting the automated, Pic & Place Machine. UPPER LEFT: Upclose photo of PCBs made at RI.

lustries, Inc.

'T IDEAS WIN ~

LEFT: Steve Jensen, a Mechanical Engineer and 6-year Raven employee, holds a RP turbine. Inset photo: A view of the RP turbine.

and console" said Dave Rohan, Production Engineer. The circuit board process begins from the stencil that serves as the blueprint for the various PCBs. The Screenprinter, a coffin-type machine, applies a 63% Tin-33% Lead solder mixture. The automated Pic & Place machine inserts the electronic components on the boards. Then, the Reflow Oven literally bakes the solder solid at 180-degree C. The Wave Solder machine has an electronic eye that identifies the incoming board, determining the wave height and chain speed that the PCB will be transported. The dwell time allowed over the solder pot is critical. This machine joins parts into one and is affected by humidity and barometric pressures during this fluxing process. A 3-D Microscope can be used to see flux, giving perception to the finished product. All products are tested for functionality in every manufacturing area.

Raven's management team believes in Cellular Manufacturing. The Production Centers are: *Flow Meters*, where flow meters are manufactured with ratings of 400 gals per minute or higher; *Consoles*, that offer touch screens and specialization; Control Valves, including butterfly valves plus on/off ball valves that are the biggest selling for Raven; *Cables*, varying in length up to 44-feet; *Injection*, where automation can pot molds 4 per minute; *Nitch "Do Everything; FMC Capture*; and *Wire Machine*, the heartbeat of the wire

LEFT: The finished turbine has magnets inside. The turbine fits inside the Flow Meter body, that is made of stainless steel.

LEFT: Dee Brush, a Production Coordinator in Flow Controls and 21-year employee. Every valve is tested for the "pulses per gallon" to obtain the accurate calibration reading. Brush enjoys the flexibility on hours at RI, especially while raising a family.

LEFT: Nicole Otto, Assembler and 3rd year employee, demonstrated the Conduit Puller that has saved labor since use to pull conduit by hand.
ABOVE: Sharlene Olauson, Assembler and 20-year employee, has worked on cables up to 44-feet in length.

ABOVE: Evelyn Mead, Machine Operator, demonstrates the Alpha 411 automated wire cut machine. UPPER RIGHT: Upclose photo of a VIPER console.

process.

The automated wire processing machine, Alpha 411, became part of Raven 5 years ago. "The machine justified itself in one-and-half years," said Rohan.

Raven's personnel are continually striving for product integrity plus quality and cost-effective production methods to pass values onto their customers. This quality-minded application aids Raven to stay competitive in today's tight markets.

Raven can specialize a product that "is similar to ordering features on a car," said Sam Morinaro, Production Assembler. These injection pumps can last a long time with good maintenance.

"There isn't anything that Raven makes, that we can't fix," said Lori Fowler, Repair Supervisor and 21-year employee. This can-do attitude is apparent in all of Raven Industries production areas.

Judy Lundstrom, Shipping Supervisor, is a second-generation employee. "I use to take the freight elevator as a kid with my Mom, who worked at Raven for 36 years."

The Shipping area operates a Cart & Flow System, where a two-week inventory is maintained, and the ordered products go from inventory to a conveyer system for easier weighing and handling. "We can move up to $400,000 product a day," said Lundstrom.

"Rapid prototyping can take a complex shape and make a 3-D model. RP decreases the amount of time to produce parts and models. This unique reproduction method allows us to have the ability to verify test results to the original part. All these serve as benefits for us to keep using RP," said Steve Jensen, a Mechanical Engineer and 1996 SDSU Mechanical Engineer graduate.

"The concept is what made rapid prototyping appealing for what we are doing," said Anthony Schmidt, Production Manager, a '95 SDSU Electrical Engineer graduate and a SDSU's MNET board member. "We will continue to utilize rapid prototyping methods when making parts for field testing where we can test the design and functionality of the whole unit."

Whether administrative personnel, a machinist, engineer or corporate officer, Raven employees seem to be equally respected and valued for their contributions within this company. To learn more about where the *Best Ideas Win* plus Raven Industries superior services and innovative products currently available, just review their company website at **www.ravenind.com ***

ABOVE LEFT: Dave Rohan (left) uses a GPRPC brochure to explain RP methods to Don Cuperus, Production Engineering Manager and 7-year employee (right). RIGHT: Jo Bottenhagen, Product Tester and 13-year employee (left) and Rohan (right). BOTTOM PHOTOS: Raven Industries Repair Dept. LEFT: Brian Lambertz, Chief Troubleshooter Technician and 24-year employee. RIGHT: Lori Fowler, Repair Supervisor and 21-year employee (left) and Mike Thelen (right), Repairer of 3 years.

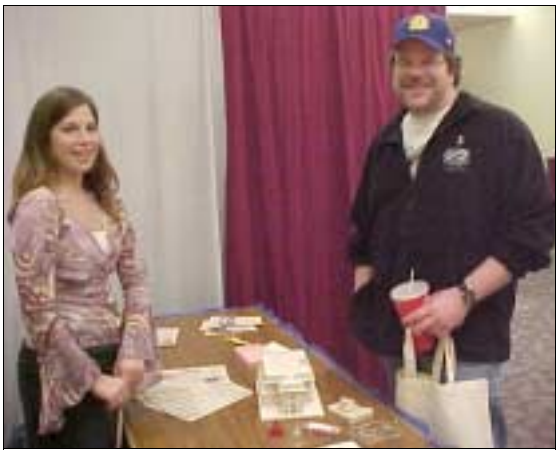
LEFT: Linda Proffitt (left) and Joan Anderson (right) are FMC Capture Kit Assemblers in Product Center 8. RIGHT: Judy Lundstrom, Shipping Supervisor and second-generation RI employee, is shown taking a shipping order.

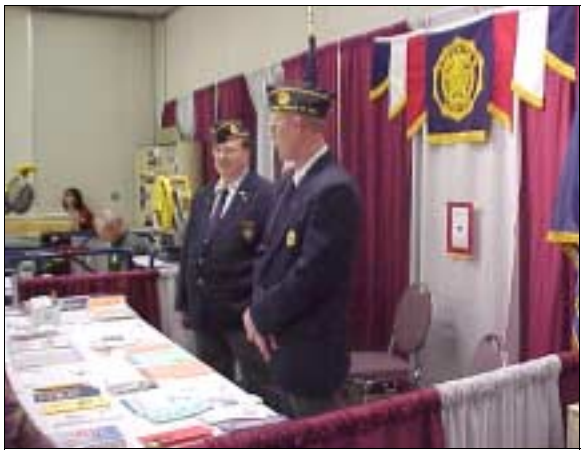
LEFT: Sam Morinaro, Production Assembler, stands by this specialized injection pump. RIGHT: Rohan (right) holds a completed console. Lane Jibben (left) is an EE & SDSU graduate.

Sioux Empire Tradeshow continued….

Sioux Empire is a non-profit trade organization started in 1956, by a group of homebuilders and suppliers to meet the needs of a rapidly growing housing industry in Sioux Falls, according to the Home Builder's Association website **www.hbasiouxempire.com** To learn more about new construction techniques, their 605 HBA members and upcoming HBA events, please review their website.

Travis Steen, Becky Scholten, Theresa Jensen, and Jerry Visser represented GPRPC during this four day promotional event.*





LEFT: Becky Scholten, a former GPRPC Employee & SDSU Engineering Student, talks with Steve Knutson, a '83 SDSU Broadcast Journalism graduate, about rapid prototyping. RIGHT: Unidentified VFW soldiers, who assisted with hanging the GPRPC banner at the Sioux Empire Tradeshow and our booth neighbors.

Lake Area Technical Institute
All Day Industry/Education Tour

Fifteen Lake Area (LA) Machine Tool students toured the Brookings community visiting Quality Tool, GPRPC, Falcon Plastics, 3M and SDSU's Machine Shop on May 1st under the guidance of Paul Streff, Instructor/ Dept. Supervisor and GPRPC Board Member.

"We like to expose students to rapid prototyping (RP) methods. Also, this will make other industries aware that GPRPC is here in the area through the students gained knowledge and how RP can really help them (industries) meet their needs," Streff said.*

ABOVE: Instructor Paul Streff (right) listens while Jerry Visser explains rapid prototyping techniques. Students Jamie Williams (left) and Landry Haich (center) look at a RP product developed at the Consortium.

ABOVE/RIGHT: Lake Area Machine Tool students ask questions after learning about rapid prototyping during this brief educational tour.

Great Plains Rapid Prototyping Consortium

Sponsors:
*Falcon Plastics, Inc.
*SDSU's Polytechnic Center of Excellence

Members:
*MTR
*Raven Industries
*Larson Manufacturing, Inc.
*First District Association of Local Governments.
*Daktronics, Inc.

Contributors:
*Excel Energy
*South Dakota Board of Regents
*South Dakota Governor's Office of Economic Development

Technical Advisors:
Vista Technologies

Interested in becoming a sponsor or member?

Benefits include:

- **newsletter and website advertising**
- **structured fees and services**
- **cost-effective product development**
- **time-effective part production**
- **premium quality and efficient local service**

Calendar of Events

April

15th Sioux Empire Excellence in Industry Symposium
***Ramkota Inn in Sioux Falls, SD**

17th Tech Summit
***Convention Center in Sioux Falls, SD**

May

1st Lake Area Industry/Educational Tour

TBA GPRPC Board Meeting
***Student Union on SDSU Campus**

Great Plains Rapid Prototyping Consortium Goals

1) Provide access to and hands-on training for students and partners in rapid prototyping equipment both on site and via the Internet.
2) Provide a venue whereby students and educations can cooperate with industry leaders and potential employers in the design process.
3) Provide a venue whereby the partners can regularly discuss design issues related to rapid prototyping while serving as a resource of additional information.
4) Provide means to improve the knowledge base in rapid prototyping and/or related technology through research activities at South Dakota State University.
5) Create an atmosphere whereby partners can enhance their ability to provide new innovative products to the customer. Also, to positively impact the South Dakota economy and the surrounding region.
6) To increase the number of memberships to cover expenses after the initial startup.

Consortium Visitors...

Gary Foos, a Smith Equipment Engineer is happy with the results of a recent rapid prototyping model completed by the GPRPC staff.

Smith Equipment is in Watertown, SD and their web-site is: **www.smithequipment.com**

How far you go in life depends on your being tender with the young, compassionate with the aged, sympathetic with the striving, tolerant with the weak and the strong—because someday you will have been all of these.

~George Washington Carver~

Consortium in Brief…

April 17th *GPRPC had a booth at* ***South Dakota Tech Summit!***
Senator Tom Daschle presented the welcoming remarks at this one day event. GPRPC shared a booth with Enterprise Institute. Breakout sessions and panel discussions filled the day's agenda from 9:30AM to 5PM.

May 2nd Roger Svec Retirement Party!
In the Solberg Annex, an *Open house* affair was held to honor Roger Svec, a long-time MNET instructor in the SDSU Engineering Department. Svec has been part of SDSU for 25 years! This will be finishing this Spring semester before beginning his retirement activities.

SDSU Students continued...