



CENTER FOR INNOVATION THROUGH  
VISUALIZATION & SIMULATION

**PURDUE**  
UNIVERSITY  
CALUMET

*Giving to CIVS*

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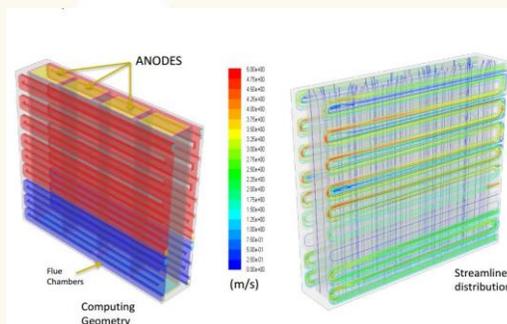


## Company Collaboration Comes Full Circle

Lazar Anode Technologies began collaboration with CIVS in 2010. The company found CIVS through technical publications and was impressed by the center's capabilities such as computational fluid dynamics (CFD) modeling expertise, ability to provide visual outputs, cost-effectiveness, timeliness, and track record of real world projects with industry.

Lazar worked with CIVS to use CFD simulation and virtual reality visualization to evaluate and optimize the design of a new Continuous Carbon Baking Furnace (LCCBF), used for anodes in the aluminum smelter industry. The simulation results were validated showing excellent agreements with the field measurements when the LCCBF facility became operational in 2013.

Lazar had close interaction with students during the project and went on to offer internship and hire a CIVS graduate, Steve Dubec as



Project Engineer where he is responsible for ensuring a project's design functions and for working on design improvements. The project collaboration provided not only technical solutions to the company, but also provided experiential learning and job opportunities to our students.



## Featured News

- [National News Highlights CIVS NIST Award for Steel Consortium](#)
- [CIVS Staff Wins Outstanding Poster Award](#)
- [Professionals to Watch: Chenn Zhou](#)
- [Grant will Help Steel Industry See and Plan for Years to Come](#)
- [CIVS Aids Push for STEM Education in Girls](#)
- [Students Learn about Hunger in 3-D Designs](#)
- [Franciscan, Purdue Cal Center Partner for Project](#)
- [CIVS Visits Wrigley to Create 3D Facility](#)

*"...doing the simulation and actually seeing what was going on, that promoted a change in our design that we have integrated now."  
— Michael Snyder, Project Manager, Lazar Anode Technologies LLC*

## CIVS Facts and Impacts

CIVS's multidisciplinary research projects are having substantial economic and intellectual impacts on local and global communities as well as providing great research opportunities for Purdue Calumet faculty and students. Following are highlights since 2009.

- \$38++ million savings for companies
- 2,950+ students used CIVS for experiential learning and virtual labs
- 84 external organizations collaborated with CIVS
- 127 completed projects
- 95 technical publications
- 383 graduate and undergraduate students employed and mentored
- 74 Purdue Calumet collaborators
- 33 student awards
- 140 national and local news
- 11,700+ local, national and international visitors since October 2011

## Selected Examples of Funded Projects

Project Title	Sponsor
3D Visualization of Manufacturing Facility	Wrigley Company
Comparison and Optimization of Blast Furnace Tuyere Designs	ArcelorMittal
Modeling of Weld Plant Production and Logistics for Rail Products	Steel Dynamics Inc.
Numerical Simulation and Optimization of Bottom-Blow Basic Oxygen Furnace	Dongying Fangyuan Nonferrous Metals
Optimization of Checker Wall Design in a CO Boiler	Blasch Precision Ceramics
Numerical Optimization of a QBOP Vessel for Minimizing Kidney Formation	U.S. Steel Corporation
Numerical Optimization of a Diesel Engine Exhaust Manifold	LHP International
Purdue University Calumet Virtual Tour	Purdue Calumet Campus Life



3D modeling and animation were used to create a visualization and interactive flythrough of an Franciscan emergency department renovation



An Interactive 3D Virtual Blast Furnace Training Package developed for U.S. Steel Corporation to train employees about key systems of the blast furnace.

## CVIS Presents at 21<sup>st</sup> Annual Crane Symposium



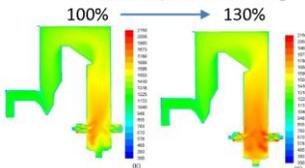
Bin Wu, Research Engineer at CVIS was invited to lead a seminar titled “*Life Prediction in Industrial Equipment*”, at AIST Symposium 2014. The seminar was held at 10:00 a.m. on Tuesday, June 10<sup>th</sup>. Wu presented a newly developed six-step methodology at CVIS to successfully predict the remaining life in an overhead crane using a combination of numerical simulations and virtual reality visualization.

The simulation results have been subsequently validated using actual structural inspection and operating data for the equipment. The final product can be used by operators and engineers to optimize existing equipment designs, reduce downtime and lost production, improve equipment inspection plans, and identify areas of opportunity for new equipment designs.

The presentation received significant interests from many attendees. Multiple companies are in commutation with

CVIS seeking collaborations to utilize this new technology for the design and optimization to address the issues of productivity, energy, environment, and product quality as well as for training and education. The symposium was attended by more than 200 plant maintenance staff; applications, electrical, mechanical, safety, service and design engineers; operations and maintenance personnel and management from over 90 companies.

## CIVS Wins Outstanding Poster Award



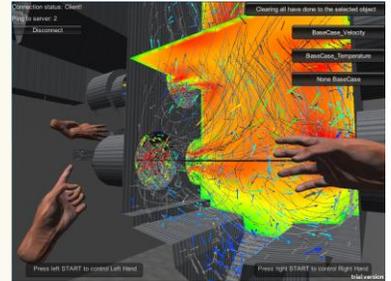
	Current	x3 htc w/ fins	+30% fuel
Total efficiency	42.0%	44.5%	45.2%
Total power [MW]	520.0	555.1	566.3
- incremental	-	6.8%	8.9%
Add cost [\$/W]	-	0.30	0.40

TE material: ZT=0.7, cost=2000 \$/kg

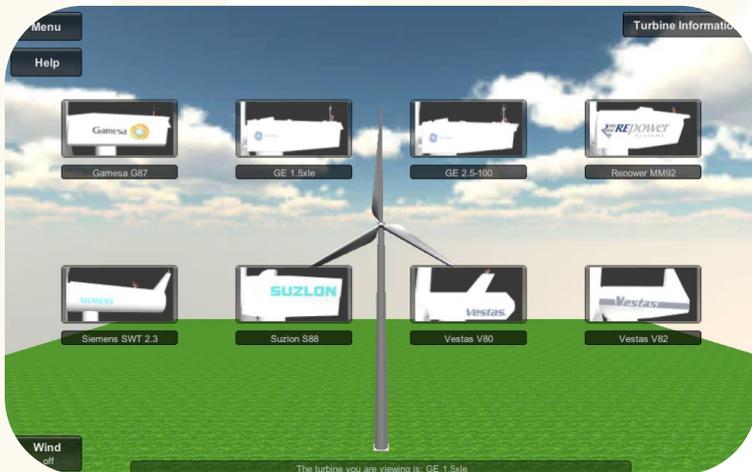
CIVS' Chenn Zhou, Bin Wu, and Armin Silaen were part of a team that received the Outstanding Poster Award at the 33rd International Conference on Thermolectrics held July 6-10. The poster, *Cost effective topping thermoelectric power generation on coal fired power plants*, was one of over 300 posters presented. The team also included Ali Shakouri, director of the Birck Nanotechnology Center and Professor of Electrical and Computer Engineering at Purdue West Lafayette, and Kazuaki Yazawa also from the Center.

## CIVS Presents at ASME Conference

CIVS presented exciting research on August 18 at this year's Computers & Information in Engineering Conference hosted by the American Society of Mechanical Engineer (ASME) in Buffalo, NY. The work titled "Consumer Virtual Reality for Collaborative Review of Power Plant Boiler Operation" discussed methodology that allows multiple users to interact with 3D simulation data using portable VR devices to point and grab objects and change operating conditions in a shared environment.



## CIVS Engages with Riverland Community College and EDF for Wind Training



CIVS hosted a representative from Riverland Community College and EDF Renewables to plan for virtual training activities using simulators for wind energy education. Kalamazoo Valley Community College also participated in planning activities to add more functionality to simulators for wind turbine technicians, including modules for maintenance, troubleshooting, and safety. The simulators are part of a U.S. Department of Education funded project to develop Mixed Reality Simulators for Wind Energy Education to improve student learning and employee training. More information is available at [www.windenergyeducation.org](http://www.windenergyeducation.org).

## Student Successes

CIVS proudly counts former graduate researcher Daniel Ratko as one of its successful alumni who began at the university majoring in Mechanical Engineering. He received his Bachelor of Science degree in 2008, and went on to receive his Master of Science in Mechanical Engineering in 2010. He joined CIVS as a student and became involved in a number of applied research projects, including the world's first Virtual Blast Furnace and solving power plant environment issues. He was hired as Construction Project Manager and Mechanical Engineer for Franciscan St. Margaret Health in 2010, and became Safety Officer in 2013.

Dan also taught as an instructor, and utilized CIVS for several sponsored research projects to use 3D visualization for construction of a special care nursery in 2011 and an Emergency Department renovation in 2014 where a newly designed emergency room was constructed to replace the existing ER. The projects used architectural drawings and photos of to create 3D models of the facilities and created flythrough visualization to provide videos for hospital personnel and the public.



## Girl Scouts Learn about STEM at CIVS

Girl Scouts from the Munster Mints participated in activities at CIVS as part of their 2014 day camp at Purdue Calumet on July 21. The scouts took part in a variety of hands-on activities to encourage interest in Science, Technology, Engineering, and Mathematics (STEM). In addition to using virtual reality to explore the human brain, the scouts also learned about wind energy, 3-D scanning, and optical illusions.



## Steel Consortium Rolls Forward



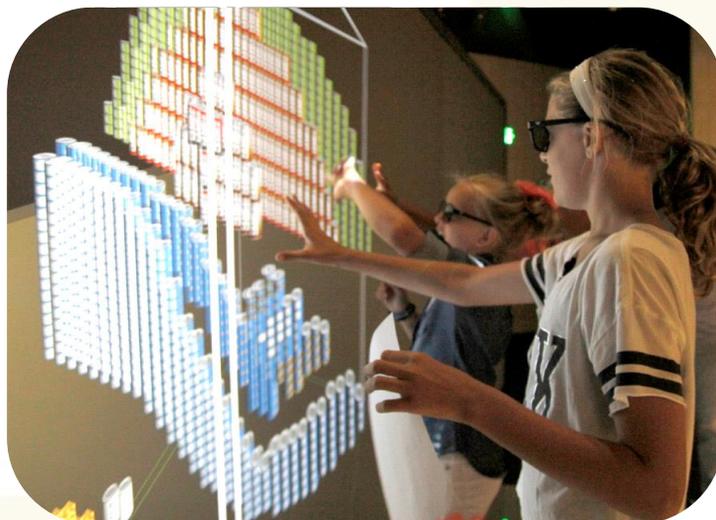
CIVS hosted two key events for the \$480,000 NIST Grant to establish the Advanced Simulation and Visualization for Steel Optimization Consortium. The NIST Project Directors meeting was held on June 27 to discuss plans and requirements for the project. The first industry planning meeting was then held on August 6 and included representatives from 17 companies and organizations. The planning meeting was very productive and successful. Thorough discussions were made related to the project goals and objectives, the formation of consortium, and the development of roadmap that will address key issues for advancing steel manufacturing cross the value chain.

## CIVS Partners with United Way for “Canstruction” Project

CIVS worked with Lake Area and Porter County United Way to help teams of kids utilize advanced 3D technologies to design and visualize a variety of super-hero themed structures that were built entirely out of full cans of food. The designs were built at a Canstruction® event held at Southlake Mall in Hobart, Indiana in late July.

Canstruction® is a unique charity which hosts competitions, exhibitions and events showcasing structures made entirely out of full cans of food. After the structures are built, the creations go on display to the public as an art exhibition. At the end of the event, all food is donated to local hunger relief organizations. This is the first time a Canstruction® event has been presented in Northwest Indiana.

Prior to the event, 9 teams of kids from Lake and Porter counties worked with CIVS staff and students to convert sketches of their super-hero themed designs into 3D models. Using 3D tools teaches the children about advanced technologies and enables them to plan and visualize realistically what their “canstructures” will look like using the actual can sizes and labels. 3D renderings were used to create posters for the event and visual aids for building the structures. The event took place publicly from 8:00am until 4:00pm on Friday, July 25 at Southlake Mall in Hobart, Indiana. The “Canstructures” were judged and then remained on display until August 2<sup>nd</sup>. The public was invited to vote for their favorite. The Celebration and Awards Ceremony will be held on Aug. 8<sup>th</sup>.



*“[CIVS Projects] have practical applications and present the information in a manner that almost anyone can understand.”*

– Bill Bobco, American Society of Mechanical Engineering, Chicago Section Chair

### Office of Institutional Advancement

It begins with an opportunity to GIVE something back to a University you care about. It ends with the realization that you helped that University GROW into something even more worthwhile than before. Are you ready to be a leader and INSPIRE others? Make a gift today by visiting us at [www.purduecalumet.edu/civs](http://www.purduecalumet.edu/civs) and clicking the “Give to CIVS” button. Your INVESTMENT in CIVS at Purdue University Calumet is an investment for your future. For more information please contact Renee Feldman, Coordinator of Annual Giving Programs, 219.989.2930, [annualgiving@purduecalumet.edu](mailto:annualgiving@purduecalumet.edu)

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