



Steel Consortium Launched

The Steel Manufacturing Simulation and Visualization Consortium (SMSVC) has officially been established on January 15, 2016. The Charter Member companies consist of AK Steel, ArcelorMittal, NIPSCO, NUCOR, Praxair, SSAB, Steel Dynamics, U.S. Steel and Union Gas.

The first Board of Directors meeting was held on December 6-7, 2015 to discuss the consortium vision and mission, technology roadmap, and 2016 research agenda. Through lively discussions and collaborative efforts, seven 2016 research projects were selected in the areas of Safety, Blast Furnace, EAF Furnace, Reheating Furnace, Secondary Cooling, Ladle, and Casting.

In June 2014, NIST AMTech Planning Grant funds were awarded to CIVS to establish an industry-led steel consortium and to develop a technology roadmap that identifies and prioritizes research projects to develop and implement simulation and visualization technologies for enhancing the competitiveness of steel manufacturing in the U.S. across its value chain.

The consortium members benefit from industry-led decision-making, accelerated innovation, value-added solutions, direct access to students, rapid access to research results, cross-learning and best practice sharing, collaborative efforts and combined resources, and leverage from various funding agencies. The consortium is currently accepting new members and welcomes the opportunity to share information with companies who are interested in becoming a consortium member. For more information, visit the SMSVC

website: www.steelconsortium.org or email: steelconsortium@purduecal.edu.

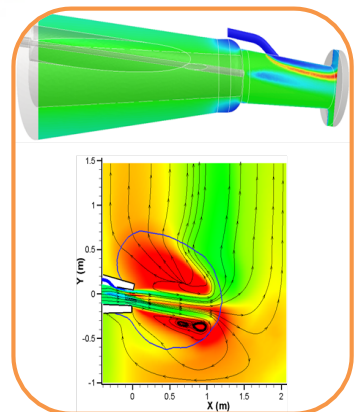


AIST Research Award to AK Steel/CIVS

A technical paper written by researchers at CIVS and AK Steel has been selected to receive an international award this spring. The paper, titled "Investigation of Co-Injection of Natural Gas and Pulverized Coal in a Blast Furnace," will receive the Association for Iron and Steel Technology's (AIST) 2016 Josef S. Kapitan-Ironmaking Award, May 16 at the AIST conference in Pittsburgh, Pa.

AK Steel Technical Manager, Ironmaking Stuart Street initiated the collaborative project to utilize the unique skill set available at CIVS. The research found that natural gas utilization for pulverized coal injection could improve total burnout from 77 percent to 87 percent. Furthermore, natural gas as the PCI carrier also potentially could improve blast furnace productivity by some 2.5 percent.

AIST is a non-profit organization with 17,500 members from more than 70 countries. With 30 Technology Committees and 22 Local Members Chapters, AIST represents an incomparable network of steel industry knowledge and expertise. For more details, read [the news article](#).



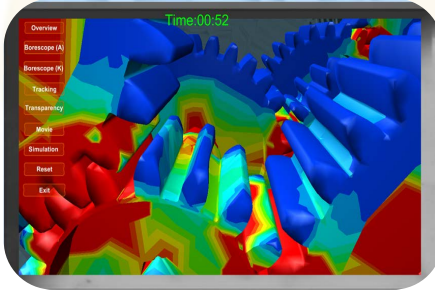
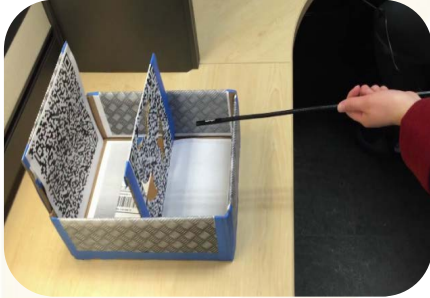
Giving to CIVS

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Simulator Improves Wind Turbine Maintenance

Using augmented reality (AR), finite element analysis, and a gaming application, a Wind Turbine Borescope Simulator was developed by senior design students to provide a new and improved way for training wind turbine technicians. The wind turbine gearbox model was designed and built with detailed stress distribution inside the gearbox. The AR environment gives trainees a realistic inspection experience. The simulator will be deployed to industry, Riverland Community College and EDF Renewables in wind energy education/training courses for testing and improving the technology.



Lockout/Tagout App for Safety



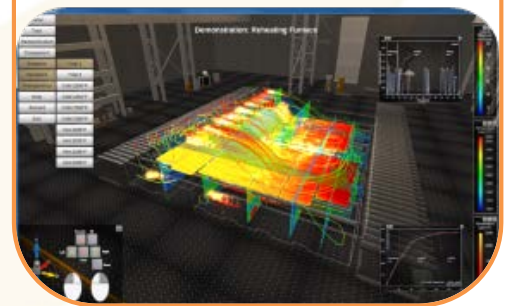
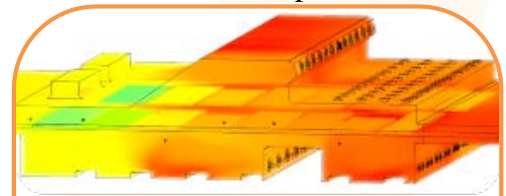
A senior design project developed an app for both the Epson Moverio and the Google Glass devices that allow users to access a library of step-by-step instructions of lock out/tag out procedures using the head mounted device (HMD) that ensures the lock out or tag out is completed properly and in the safest way possible.

Project Aims to Optimize SSAB Slab Reheating Furnace

As part of the steel production process, steel slabs are often reheated in order to elevate their temperature. Before the hot rolling process, the steel slabs are heated to approximately 1,500K, and this reheating is one of the most energy consuming processes in steel product manufacturing. By developing a better understanding of the operation of a reheat furnace, steel companies could save big on fuel and productivity.

To help global steel company SSAB better understand the reheating process, CIVS research assistants, together with SSAB's research engineers from Montpelier, Iowa, developed a three-dimensional computational fluid dynamics (CFD) model and a two-dimensional numerical heat transfer model. The heat transfer model was validated by using mill data from instrumented slab trials, and resulted in agreement between model predictions and production data. The models will be used to ensure high furnace throughput and a uniform temperature distribution within reheated slabs. This project achieved great results and will provide real-world improvements and cost savings for the company.

Participants from SSAB Americas R&D team included Drs. Dengqi Bai (Sr. Research Engineer) and Yufeng Wang (Research Engineer). Mr. Rick Bodnar, the Director of SSAB Americas R&D, views the project as a great success. "This project was an excellent example of collaboration between industry and a university," he said. "Together, we developed a very convenient and user-friendly tool which can be used by researchers and mill metallurgists in troubleshooting and optimizing our process."



English Professor Uses Serious Gaming for Teaching



Dr. Mark Mabrito collaborated with CIVS to create a 3D role-playing game ("Appealia") designed to teach players about rhetorical appeals. The concept for the game developed from a summer workshop on Serious Games and Virtual Worlds that Professor Mabrito offered for several composition instructors. He and the workshop group collaborated on developing the game's design/concept document that was later developed into a 3D game by CIVS. The game is currently being tested in the classroom. Professor Mabrito has a long teaching/research interest in new and interactive media. He developed and currently teaches courses in the English Department's Online Certificate in Writing for Interactive Media.

NIPSCO 9th Consortium Charter Member

NIPSCO recently became the 9th charter member of the SMSVC consortium. NIPSCO is Northern Indiana's gas and electricity provider. Company representatives and leadership are extremely excited about the membership and look forward to their continued involvement with SMSVC in support of the steel industry and the region. Experiencing the new technologies of Oculus Rift (pictured) is Karl Stanley, NIPSCO's VP of Commercial Operations. Mr. Stanley sees the SMSVC and CIVIS as true research and education resources to the steel producers and their suppliers, as well as other industries. He said "Simulation and visualization provide new and more effective ways work."



Students Contribute to Steel Wheel

CVIS collaborated with the Association for Iron & Steel Technology (AIST) in developing an innovative tool that enables greater understanding of the steelmaking process. CIVIS students worked with AIST staff members and CIVIS faculty and staff to create an online, interactive resource tool. The Steel Wheel includes three-dimensional imagery and videos plus descriptive text on each part of the Wheel.

AIST officials refer to the Wheel as a one-of-a-kind experience that allows individuals to click onto each phase of steelmaking to gain a deeper understanding of the steel production process. Read the [news article](#) and interact with the [Steel Wheel](#).



Director Supports 1st TMS Summit on IMMI



Dr. Chenn Zhou served as a member of the advisory committee for the TMS's 1st Summit on Integrated Manufacturing and Materials Innovations (IMMI) this past November in Pittsburgh. Dr. Zhou presented two papers: "The Integration of Advanced Simulation and Visualization for Manufacturing Process Optimization" and "Comprehensive Numerical Modeling of the Blast Furnace Ironmaking Process". The Summit Organizing Chair is Dr. Frank Gayle, the NIST Deputy Director (see picture).

Steel Dynamics' Butler Plant Toured

CVIS researchers toured Steel Dynamics' electric arc furnace located in Butler, IN on January 15, 2016. The tour and meeting at SDI in preparation for the steel consortium's 2016 research project about the electric arc furnace. Pictured are Andrew Spencer, Chenn Zhou, Jesus Corona de la Fuente, Kenneth Gephart, Bin Wu, and Armin Silean.



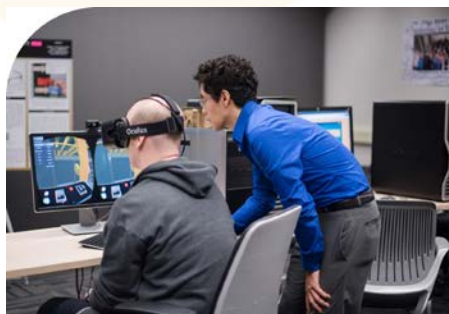
Student Success: Matt Cross



Matt Cross has been a student researcher at CIVIS since his freshman year in 2012. He is a graduate of Highland High School and will receive his B.S. in Mechanic Engineering in May 2016. At CIVIS, he participated in several industrial projects which he attributes to his success in receiving an internship and a job at SAIC, a local technology and engineering company. Matt said, "As a student worker at CIVIS, it gave me the real-world experiences I needed. Interacting with industry collaborators and other CIVIS researchers sharpened my skills and provided me opportunities to practice speaking and time management skills both of which are critical in today's job market."

Examples of Funded Projects

PROJECT	SPONSOR
Flue Structural and Thermal Modeling of an Anode Baking Furnace	ALCOA
The Virtual Blast Furnace: An Integrated High Performance Computing Modeling, Simulation and Visualization Capability for Steel Manufacturing	Lawrence Livermore National Labs
3D Visualization of Steel Component Inclusions and Stress	Timken Steel
The Analysis of High PCI Rate for a Blast Furnace	U.S. Steel
Continuous Cast Slab Scheduling Protocol	ArcelorMittal
Numerical Optimization of a QBOP Vessel for Minimizing Kidney Formation	U.S. Steel Corporation
Selective Catalytic Reduction Flow Model Analysis for Power Generation Station	NIPSCO



Facts and Impact (Since 2009)

- \$38++ million savings for companies
- \$11+ million in external grants and contracts
- 92 external organizations collaborated with CIVS
- 145 completed projects
- 120+ technical publications
- 216 national and local news
- 800+ students employed and mentored
- 4,000+ students used CIVS for virtual labs
- 86 Purdue Calumet faculty and staff collaborators
- 47 student awards
- 48+ undergraduate research grants (since 2011)
- 21,000+ local and global visitors

Office of Institutional Advancement – Giving to CIVS



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