



## Spotlight on Safety

Safety is a major concern for the steel industry and a priority focus for members of the Steel Manufacturing Simulation and Visualization Consortium (SMSVC). To meet the challenge, CIVS is developing new safety training tools that engage workers through interactive simulations under the guidance of the SMSVC project technical committee (PTC) members. A beta version of "Fall Protection Safety Simulator" is now available to consortium members for testing.

The simulator takes trainees through a scenario of working at height on a recuperator, making choices along the way to select Personal Protection Equipment, choose anchor points, practice safety awareness and experience the consequences of unsafe actions. In recent months, this simulator has been presented to ArcelorMittal, Steel Dynamics Inc. and U.S. Steel. Steel Dynamics Inc. has tested the simulator with positive feedback from participants. The training supervisor noted that "it created several teachable moments and forced my new hires to engage in a more active manner."

CIVS is also developing a safety simulator "Interactive Training for Heavy Mobile Equipment Safety" under a Don B. Daily grant from the AIST Foundation. The project is under the direction of John Moreland, CIVS Senior Research Scientist and PNW Professor of Nursing Michelle Block. [Read more...](#)

The 3D interactive simulators are proving to be a more engaging, cost-effective method of reaching the industry workforce and helping consortium members meet their safety goals. CIVS and the SMSVC are working with industry trainers and union representatives to identify additional simulation scenarios.



## Recent Activities for Safety Simulators

In order to demonstrate safety simulators and understand specific training needs, a number of meetings were held at CIVS and industrial sites. The following are examples:

- CIVS staff and students presented the SMSVC Safety Simulator at ArcelorMittal Deerfield Training Center on August 9<sup>th</sup>, 2016
- USS Union safety/training representatives from US Steel Gary Works visited CIVS on 8/31/16
- CIVS staff and students presented the SMSVC Safety Simulator at Steel Dynamics new employee training session and their Safety Summit in September



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## **CVIS Partners with Carbontec and Livermore National Lab on New Ways to Convert Steel Waste into Iron Nuggets**

The U.S. Department of Energy recently announced a \$300,000 grant to Purdue University Northwest CVIS, Lawrence Livermore National Laboratory (LLNL) and Carbontec to utilize LLNL’s super computers and Purdue’s modeling expertise to optimize the design of the E-Iron Nugget Process furnace, which is expected to lower the cost of plant construction and improve energy efficiency

As steel companies have become interested in cost-saving measures, Carbontec is working with a large, international steel company to convert iron bearing steel mill waste products into iron nuggets, according to the company. Currently, that waste is stockpiled, buried on site or hauled to commercial waste dumps at a cost of \$20 per metric ton.

Carbontec Energy Corp. Chairman John Simmons said the company is looking for funds to build a \$70 million plant in Northwest Indiana. That plant would initially employ 40 people at a 100,000 metric ton-per-year plant near the steel mills in Northwest Indiana.

“The Carbontec project not only can help find ways to recycle waste from steel mills, but could also help find new ways to use biomass, a renewable energy source, and reduce carbon dioxide emissions” said CVIS director Dr. Chenn Zhou. [Read more....](#)



## **AIST Ironmaking Technology Committee Hosts September Meeting at CVIS**

On Wednesday, September 9, 2016, the Association for Iron & Steel Technology – Ironmaking Technology Committee (AIST-IMTC) hosted its monthly meeting at Purdue University Northwest’s Center for Innovation through Visualization and Simulation (CVIS). A highlight of the meeting was the presentations given by Dr. Chenn Zhou and CVIS students. The committee interacted with new technologies of Augmented Reality for safety and training. Following the meeting at CVIS, the group was then given a tour of the ArcelorMittal Indiana Harbor blast furnace.



## **AIST Foundation Interviews Trustee Zhou**



In its October 2016 AIST magazine issue, Dr. Chenn Zhou, an AIST Foundation board member since 1994, was interviewed on her board experience. Dr. Zhou said: “I feel my passion in education and

technology fits with the mission of the AIST Foundation, which is to ensure the iron and steel industry of tomorrow will have a sufficient number of qualified professionals.” The AIST Foundation supports student scholarships, internships and plant tours. It also funds research projects where undergraduate and graduate students collaborate with faculty. [Read more...](#)

## **Spotlight on Faculty: Dr. Hairong Zhao**



Dr. Hairong Zhao, Associate Professor of Computer Science, has been a faculty member in the Department of Mathematics, Statistics and Computer Science since 2005. Her research is focused on algorithm design for optimization problems. Dr. Zhao is leading a team at CVIS that is working with ArcelorMittal to develop scheduling software for their twin strength caster. The software is intended to determine the most efficient sequence of producing steel slabs of various sizes and grades while minimizing the number of adjustments to the caster between orders. Dr. Zhao’s project provides great experience for the students on her team in solving very complex logistical problems in actual industrial settings.

## CVIS Table at PNW Pride Week

Every year, Purdue University Northwest holds Pride Week the first week of the new school year, to kick off the new school year with games, music, food and fun and learn about some of the resources that PNW has to offer. The Center for Innovation through Visualization & Simulation held a table during the event. At the table, CIVS students gave demonstrations on a 3D monitor of some of the projects CIVS has worked on.

CIVS students learn and work in video editing, computer programming, 3D modeling, Autodesk Inventor, Computer aided design (CAD), Computational fluid dynamics (CFD) and Finite element analysis (FEA) and much more.



## PNW McNair Students Visit CIVS

Purdue Northwest's McNair Achievement Program held a workshop for 50, local high school students at Purdue Northwest – Calumet Campus on July 20, 2016. The workshop “Project Outreach & Prevention” focused on professional health careers. While at the PNW-Calumet Campus, students had the opportunity to visit CIVS and to view a presentation in the 3D Immersive Theater on health-related projects developed at CIVS. Projects demonstrated to the students were the Alverno 3D Lab Visualization and Nursing Interactive Training Simulator.



## Blast Furnace Book Authors Visits CIVS

On July 21-22, 2016, William (Bill) Davenport, Professor Emeritus, (University of Arizona); Ian Cameron, (Iron & Steel, Hatch Ltd); Mitren Sukhram, Engineer in Training, (Iron & Steel, Hatch, Ltd.); Kyle Lefebvre, Engineer in Training, (Iron & Steel, Hatch Ltd.); William Dixon, Summer Intern (Iron & Steel, Hatch) visited CIVS to gain new insight on the research being conducted at CIVS on the blast furnace for the purpose of rewriting the book “The Iron Blast Furnace – Theory & Practice”, which was published in 1979.

The book presents the significant role of iron blast furnace by which iron is efficiently and rapidly reduced from ore and it is the basis for all primary steelmaking. It includes essential contents of a blast-furnace process including overview of the process, blast furnace geometry, production rate, products, raw materials, operation, and costs, the development of a model framework, as well as the optimization of furnace operation. This book has been a valuable resource for engineers.

## Student Success Story: Kyle Toth



Kyle Toth is a first year graduate student in Electrical and Computer Engineering at Purdue Northwest. Kyle is a 2016 graduate of Purdue Calumet, having received a B. S. in Electrical Engineering. As a senior, under the supervision of Professor Constantine and CIVS staff, Kyle and his senior design teammate developed a prototype visualization of an AC motor as a teaching tool in Electrical Engineering courses. His senior design project at CIVS has inspired him to pursue his Master degree and to continue his research projects at CIVS. This semester he is working with Alverno Labs on a virtual tour. It provides a simulated representation of the lab's highly specialized equipment that represents its sophistication without compromising its safety or its environment. Kyle is also a member of the ATE Wind Turbine project team.

Kyle was attracted to engineering out of an interest in circuit design and circuit problem-solving. He enjoys working on projects that integrate electrical and mechanical engineering.

## Examples of CIVS Projects

PROJECT	SPONSOR / COLLABORATOR
Dustcatcher Performance Study for a Blast Furnace	ArcelorMittal
Ladle Skimmer Simulation	U. S. Steel Corporation
3D Alverno Clinical Laboratories Virtual Tour	Alverno Laboratories
Minimization of Slab Turn-up in Hot Rolling	U. S. Steel Corporation
Analysis of Flow Inside Blast Furnace Hearth	U. S. Steel Corporation

## Steel Consortium Updates

- **Annual Meeting Scheduled for November 16-17, 2016** – Registration is open for the SMSVC Semi-Annual Meeting on November 16-17, 2016. For more information contact Doreen Gaboyan at [gaboyand@pnw.edu](mailto:gaboyand@pnw.edu).
- **Consortium Accepting New Members** – The SMSVC is currently accepting new members. If your company is interested in becoming a consortium member please contact Doreen Gaboyan at [gaboyand@pnw.edu](mailto:gaboyand@pnw.edu) for more information. For additional information on the consortium visit the website [steelconsortium.org](http://steelconsortium.org).
- **New Email and Website Domains** – Purdue University Calumet officially changed its name to Purdue University Northwest. Our e-mail and web domains have been changed from purduecal.edu to pnw.edu. Our new consortium e-mail is [steelconsortium@pnw.edu](mailto:steelconsortium@pnw.edu).

### Consortium Project Topics

- Safety Training
- Blast Furnace
- Electric Arc Furnace
- Primary Cooling for Casting
- Secondary Cooling for Casting
- Ladle
- Reheating Furnace



## Facts and Impact (Since 2009)

- \$38+ million savings for companies
- \$15,542,768+ million in external grants and contracts
- 98 external organizations collaborated with CIVS
- 232 projects
- 243 national and local news
- 1,000+ students employed and mentored
- 4,636+ students used CIVS for virtual labs
- 95 Purdue Northwest faculty and staff collaborators
- 56 student awards locally and globally (since 2011)
- 22,843+ local and global visitors

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