# CIVS Newsletter

September 2020 — *"Where Ideas Become Reality"* — Issue 26



CENTER FOR INNOVATION THROUGH VISUALIZATION & SIMULATION

PURDUE UNIVERSITY NORTHWEST

STEEL MANUFACTURING SIMULATION & VISUALIZATION CONSORTIUM

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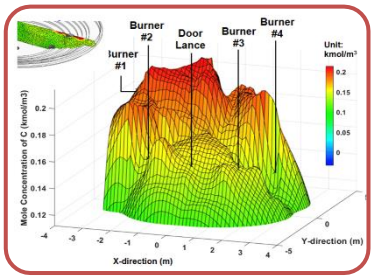
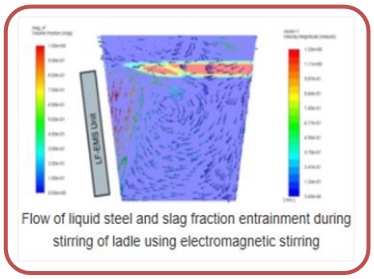
## CIVS Collaborates with ArcelorMittal, NLMK, and Oak Ridge National Lab on Supercomputing Grant

CIVS is part of two Department of Energy HPC4Mfg Grants to use high-performance computing technology to optimize steelmaking processes. The first is for Steel Refining Ladle Processing in collaboration with ArcelorMittal and Oak Ridge National Lab. "We have a long history working with Purdue University Northwest benefitting from their vast expertise in the ladle process and simulation of that process," said Pallava Kaushik, Manager of Steelmaking and Casting, ArcelorMittal Global Research and Development, East Chicago. "This is perfect collaboration with ArcelorMittal representing the operations, Purdue Northwest representing academia and ORNL providing high-performance computing. (More…) A second project is for an Electric Arc Furnace in collaboration with NLMK and Oak Ridge National Lab. More…




Flow of liquid steel and slag fraction entrainment during stirring of ladle using electromagnetic stirring

## CIVS Develops Augmented Reality for AIST Digital Transformation

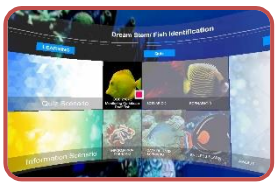
CIVS senior research scientist John (Jack) Moreland is the winner of the AIST Foundation Digital Transformation for Steel Manufacturing Grant for 2020-2021. His project is to develop an Augmented Reality (AR) Maintenance and Safety Simulator (ARMSS), in collaboration with managers, instructors, and safety personnel from Steel Dynamics and ArcelorMittal. **More…**

## Development of a "Digital Twin" for CESMII and ArcelorMittal's Zero Defect Slab Casting

CIVS is partnering on a CESMII project titled "Production of Zero-defect (ZD) Slabs through the Implementation of Smart Manufacturing Technologies in Steel Continuous Casting". The team is led by ArcellorMittal in partnership with three universities: Missouri S&T, RPI & PNW. CIVS is responsible for developing and deploying a digital twin of the pilot caster (both online and offline) which can track casting parameters, equipment and sensor parameters relevant to machine conditions. **More…**

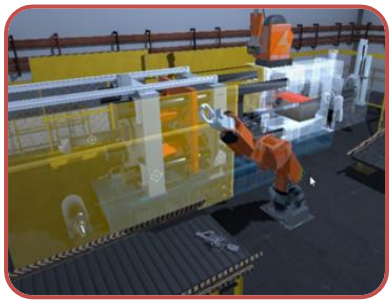
## CIVS Develops Underwater VR with College of the Florida Keys

CIVS is developing a series of underwater VR lab modules for Marine Science and Technology courses through the NSF-sponsored DREAM STEM project (Developing Reliable Educational Avenues to STEM Careers). **More…**



## CIVS Presents Webinar Series to Die Casting Industry

CIVS researchers Kyle Toth and John "Jack" Moreland presented a series of webinars to members of the North American Die Casting Association (NADCA) on June 2 & 3. Additionally, CIVS researcher Tyamo Okosun will present "Computational Modeling and Visualization of Industrial Furnaces" at the Virtual Die Casting Congress & Tabletop held October 20-22. **More…**

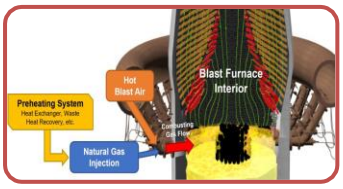


## Webinar: Troubleshooting and Safety Simulator for Wind Turbine Technician Education

On May 29th CIVS presented a webinar on a NSF ATE simulator developed for wind turbine technician education. The webinar was hosted by the Center For Renewable Energy Advanced Technological Education (CREATE). **More…**


## CIVS, SMSVC, and National Lab Project Presentations at DOE Manufacturing Day

Two collaborative projects funded by the HPC4 Manufacturing program will be presented at DOE Manufacturing Day on October 2nd. One is for a model Blast Furnace in collaboration with LLNL. The other is for a Reheating Furnace in collaboration with ANL & Arcelormittal. **More…**



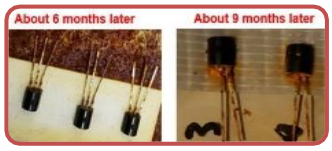


## Steel Safety Simulator Update

The SMSVC Safety Committee is continuing to develop virtual training simulators for safety training in the steel industry. The committee continues to grow the consortium's library of simulators and virtual hazard recognition scenarios using a combination of 360-degree video and interactive elements. **More…**


## Lifetime Prediction for Electronics Funded by DOD NSWC Crane Division

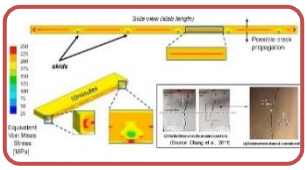
CIVS was awarded a DoD grant in Spring 2020 from the Naval Surface Warfare Center (NSWC) – Crane Division for the study of lifetime prediction for electronics components. Using the combined tools of experimental studies, statistical analysis, and numerical modeling, students examined the aging of a transistor under different environmental conditions. Working with Prof. Hansung Kim of Mechanical Engineering and Research Engineering and Nick Walla of CIVS, students Emily Higley and Konstantinos Triantafyllou worked throughout the summer to secure this great achievement. **More…**



## CIVS Virtual Fall Orientation and Operation Update

The CIVS Staff hosted a virtual orientation for more than 30 student workers and research assistants on August 17, 2020. CIVS has been operating virtually since March. Our team uses Discord very effectively to communicate while working remotely. We use multiple virtual meeting rooms and offices to host internal meetings with video and screen sharing. We are also using Zoom and WebEx to host virtual meetings with our collaborators and for weekly CIVS Seminars. **More…**

## Reheating Furnace Thermal Stress Analysis Presented at ASME Virtual Conference



CIVS Graduate Research Assistant Francisco J. Martinez represented CIVS and presented the research paper titled "Numerical Analysis of Thermal Stress Development of Steel Slabs in a Pusher-Type Reheat Furnace" at the ASME Summer Heat Transfer Virtual Conference on July 15th, 2020. **More…**

## Two CIVS Students Received Their Master Degrees in Mechanical Engineering

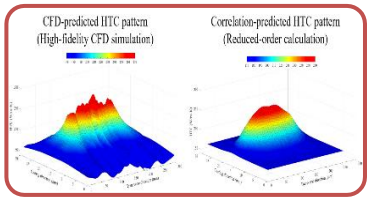
CIVS Graduate Research Assistants Edwin A. Mosquera and Xiang Zhou recently received master degrees with Thesis option in Mechanical Engineering from PNW. **More…**

## 1st & 2nd Place at Senior Design Day

Congratulations to CIVS Senior Design Students and their mentors! First Place: Design and Optimization for Free-Burning Arc in the EAF; Second Place: Design of an Adjustable Nailboard to Measure Surface Velocity in a Steel Continuous Caster. **More…**

## Spray Cooling Prediction Software Featured at AIST Digitalization Applications Webinar

CIVS PhD student Haibo Ma presented a paper titled "Spray Cooling Heat Transfer Coefficient Prediction in Continuous Casting" at the AIST Digital Applications Webinar Series on Sep. 17th, 2020. **More…**


## CIVS Student Earns Unity Certification

CIVS graduate student John Estrada recently earned Unity Developer Certification. Unity is an interactive 3D platform used by CIVS to create many of the virtual reality and training applications for industry and educational research projects. The certification is an international recognition that demonstrates proficiency and is part of the professional certificate program. **More…**

## Graduate Student Starts Career at ArcelorMittal

CIVS Research Assistant Bethany Worl graduated in December 2019 with a Master's Degree in Mechanical Engineering. In January 2020, she began working in the plate mills of ArcelorMittal Burns Harbor as an Associate Process Automation Engineer. Bethany said, "CIVS not only gave me experience working with industrial professionals, but also helped me gain knowledge of steel mill processes that directly impact the work I do today. My own graduate studies focus on furnace modeling has helped me to understand the level-2 models I currently work with." **More…**

## Productive Virtual Steel Consortium Semi-Annual Meeting

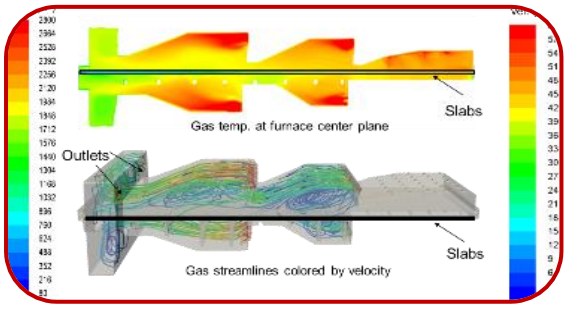
The SMSVC had its Spring semi-annual meeting virtually using WebEx on April 21-23, 2020. Over 80 engineers and managers from the SMSVC member companies attended the meeting. CIVS research staff and students made technical presentations on seven project topics, followed by very active discussions. At the conclusion of the meetings the SMSVC board held a thorough project review and set directions for future work. The Board provided excellent feedback and comments on project progress and outcomes, presentation quality, and the smooth management of the virtual meeting. **More…**

## Drs. Chenn Zhou and Tyamo Okosun to Serve as Guest Editors for a Special Issue of *Processes*

Drs. Zhou and Okosun will serve as guest editors for a special issue of the journal *Processes* entitled "Multiphase Reacting Flows: Modeling and Simulation." *Processes* provides an advanced publication forum for process and systems related research in chemistry, biology, materials, and other related fields. Papers will be accepted until June 2021 and should be submitted on the website. **More…**

## Reheat Furnace Modeling Presentation to Linde

CIVS researchers presented modeling and simulations of a reheating furnace in the steel industry for Linde managers and engineers in Europe, Asia and North America on August 11th, 2020. **More…**




## Dr. Tyamo Okosun to Deliver Seminar on Blast Furnace Modeling at Carnegie Mellon

On October 30th, CIVS Senior Research Engineer Tyamo Okosun will deliver a virtual presentation titled "Multiphase Reacting Flow in the Blast Furnace," at the Carnegie Mellon University Fall 2020 Dept. of Materials Science and Engineering Graduate Seminar Series. **More…**

## Senator Todd Young visits CIVS

U.S. Senator for Indiana, Todd Young, visited CIVS on July 6th to learn about the technological innovation and commercialization happening through the center and the benefits for Northwest Indiana's economic development. During the visit, CIVS Research Engineer Kyle Toth showcased CIVS projects and demonstrated AR & VR technologies. **More…**

## SMSVC NOTES

**Online Fall 2020 Semi-Annual Meeting:**

**November 3 - 4, 2020**

**SMSVC Accepting New Members**

SMSVC is accepting new members. If interested in becoming a member, please contact Melissa Mollett at mmollett@pnw.edu.

For information on the Consortium, visit steelconsortium.org.

## Facts and Impact [Since 2009]

- $40+ million savings for companies
- $19,600,000+ in external grants and contracts
- 145+ external organizations collaborated with CIVS
- 390+ projects
- 510+ national and local news
- 1,650+ students employed and mentored
- 11,300+ students used CIVS for virtual labs
- 140+ Purdue Northwest faculty and staff collaborators
- 239 student awards and grants (globally, since 2011)
- 35,300+ local and global visitors