



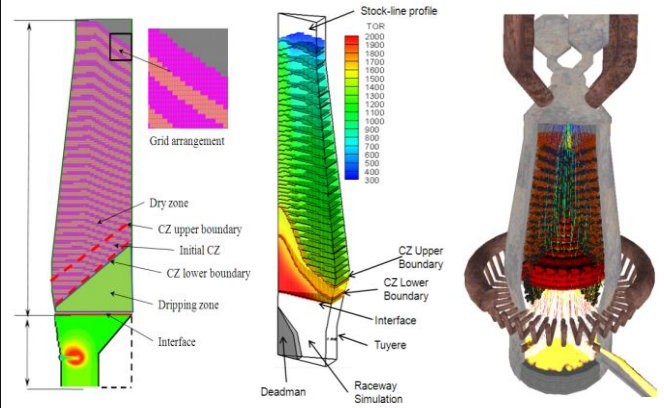
# BLAST FURNACE

## Development of a Comprehensive Blast Furnace Package

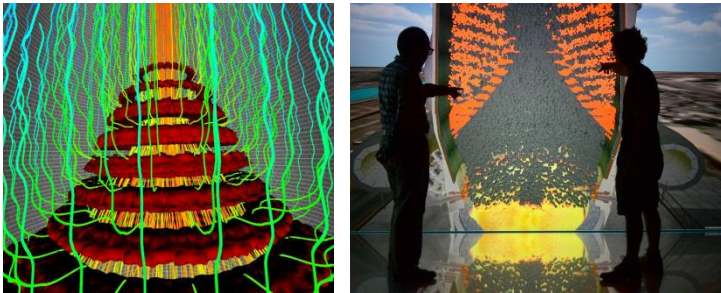
### THE PROBLEM

Ironmaking and steelmaking involve many capital and energy intensive processes. As the most important component in ironmaking industry, blast furnace has received considerable interests and resources conducting research. Due to complex phenomena and the difficulties in taking measurements, the knowledge needed for optimization of blast furnace operation can be most readily obtained by using numerical simulation and Virtual Reality visualization:

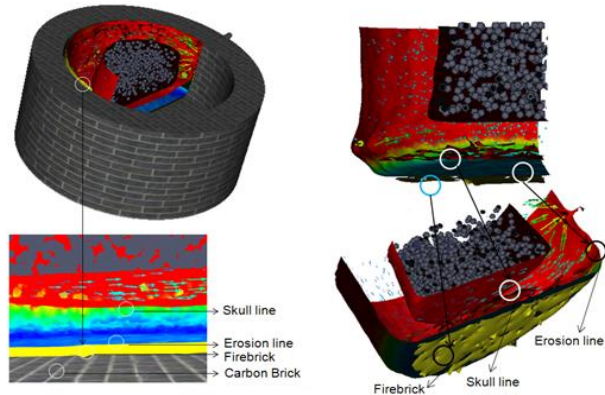
- ❖ To extend furnace campaign life and increase productivity
- ❖ To improve energy efficiency and fuel utilization
- ❖ To reduce pollutant Emissions and avoid downtime



Blast furnace simulation and visualization



Gas and burden distribution inside blast furnace shaft



Flow and erosion patterns inside blast furnace hearth

Sponsor & partners: American Iron and Steel Institute, ArcelorMittal USA, ArcelorMittal Dofasco, SeverStal, U. S. Steel, Stelco Inc., and Union Gas

### THE PROJECT

Researchers and students at CIVS have worked together with many industry collaborators to create a comprehensive blast furnace package combining numerical simulations of various complex processes with a virtual reality blast furnace system. The comprehensive package includes typical operation processes such as charging process, burden descending and gas distribution, coke and coal combustion, bottom hearth inner profile, etc. By converting and combining the numerical data to a Virtual Reality environment, the development of this blast furnace package allows researchers, plant engineers, operators, and other personnel to bring their experiences directly into the design and optimization process.

### THE OUTCOME

This extensive research has had significant impacts on blast furnace operations. It has provided:

- ❖ Savings of over **\$20 million** cost avoidance
- ❖ Guidance for design, monitoring, and optimization
- ❖ Troubleshooting
- ❖ A virtual blast furnace for training
- ❖ Copyrighted software packages
- ❖ International awards



## CENTER FOR INNOVATION THROUGH VISUALIZATION AND SIMULATION

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