From the Editor

Looking Outside Your Sandbox

Recently, I participated in a two-day seminar, "Smart Foundry–Sand Control," conducted by Dr. Sam Ramrattan at Western Michigan University. While speakers from the USA and around the world presented on emerging technologies and approaches to green and chemically bonded sand control, the overall theme was: "How can we make sand castings without the touch of human hands?" While great strides have been taken to implement many of the components of *Industry 4.0* (SM—smart manufacturing) to create the basis for *Foundry 4.0* (Smart Foundry), it was felt that the sand side of the business has lagged on the metal technology side and thus limiting us from achieving Sand Control 4.0. The designation "4.0" references what is predicted to be the next phase of the Industrial Revolution which is implementation of SM according to the National Institute of Standards and Technology (NIST) to create systems that are "fully integrated, collaborative manufacturing systems that respond in real time to meet changing demands and conditions in the factory, in the supply network and in customer needs."

During my dinner presentation, "Thinking Digitally–Working Smartly," I asked attendees to consider the premise, do you effectively create SM–integrating technologies like artificial intelligence that are based solely upon data analytics, past internal and perhaps externally mined information? Is it just an enhanced reaction and response via the developed algorithms and sensor inputs that drive smart manufacturing? Can you, and should you, also embed more fundamental theories such as fluid mechanics, pressure laws, gravity and momentum into the equation? What is the value to consider looking "outside your sandbox" of your own construct by evaluating what other laws of physics might be applicable and then start searching how they are used to solve problems in different industries, disciplines and situations.

> ***"What is the value to consider looking 'outside your sandbox' of your own construct…"***

While not directly involved in creating an AI-based formula or smart manufacturing device, this was exactly the approach taken by Dr. Ramrattan and the AFS Mold-Metal Interface Committee when looking at how sand mold and core coatings perform. Although our industry did have existing approaches to testing, evaluating and monitoring the use of the coatings, it was discovered that they were not performance-based, semi-qualitative, quantitative and predictive. What was needed was a "look outside" the walls of the box that constrained us and the answers were found, oddly enough, in the room next door. This was in the laboratory of Dr. Margaret Joyce, a professor in Paper Engineering, Chemical Engineering and Imaging at the WMU Paper Institute—Center for Coating Research and Development, who gave us insight into looking beyond just Baume and at the rheological properties, since coatings are shear thinning. Also additives like surfactants control the capillary action of coating into the sand interface. This leads to a new appreciation of how to effectively measure and control mold and core coating in a quantitative manner.

When gathering information to begin your "look outside," take advantage of AFS resources that are at your fingertips. Go to the newly redesigned AFS website to access a valuable series of archived webinars and preview upcoming webinar topics available to AFS members at: https://www.afsinc.org/members-only-webinars.