Kinnor Chattopadhyay University of Toronto

KENT D. PEASLEE JUNIOR FACULTY AWARD

The steel industry is a source of employment for more than 50 million people globally and there is an urgent need for a well-trained workforce. The University of Toronto is expanding in the area of process metallurgy, and iron and steel is within its strategic education plan. In my group, we endeavor to make University of Toronto a world-class center for ferrous process metallurgy.

During the 2017–2018 year, we finalized water model labs for research, education and demonstration purposes. These were developed in collaboration with ArcelorMittal Dofasco G.P. and Rio Tinto Iron and Titanium. In addition, advanced modeling software/techniques like ANSYS and FactSage were introduced in steelmaking courses to simulate various ferrous processes.

Close ties were established with the local steel industry and service providers: ArcelorMittal Dofasco G.P., Rio Tinto Iron and Titanium, Stelco, Algoma, M.N. Dastur & Co. (P) Ltd., AK Steel Corp. and SSAB Americas. A three-day field trip to Rio Tinto Iron and Titanium was organized, where the students visited the billet caster, metal powder plant and technology center. The group has also been involved with AISI in sensor development projects.

Two-hour short courses were organized, covering continuous casting, belt casting, artificial intelligence and sustainability. Approximately 20 students attended the courses. In addition, outreach lectures were given at international events in India and Mexico.

Research activities included:

- Development of a new submerged-entry nozzle flow index for predicting steel meniscus velocity inside a continuous caster mold by physical modeling experiments (ArcelorMittal Dofasco G.P., 2018–2021).
- Fluid flow modeling of a curved continuous slab casting mold (Stelco, 2018–2022).
- Electroslag remelting techno-analysis study with specific emphasis on recycling and reusing wastes, and emissions reduction (RS+CO, Port Colborne Steel, 2018–2021).
- Optimizing tundish performance by controlling fluid flows (ArcelorMittal Dofasco G.P., 2016–2021).
- Mold flow optimization and increasing caster productivity (ArcelorMittal Dofasco G.P., 2016–2021).
- Physical and mathematical modeling of water atomization of steel (Rio Tinto, 2016–2019).
- Machine learning model of a blast furnace (M.N. Dastur & Co. (P) Ltd., 2018–2020).