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Industry Presentation

Title: **Novel Steel Grade Design and Use Case Demonstration Towards Improving the Process Chain and Reducing the Environmental Impact via Decarbonization**

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Arcan F. DERICIOĞLU

Prof. Dr. Arcan F. Dericioglu received his Ph.D from The University of Tokyo in Materials Science (2002) and had lectured and conducted research at various academic institutions in Japan and in USA. Currently, Dr. Dericioglu is a full professor at the Department of Metallurgical and Materials Engineering of the Middle East Technical University, Turkey. Simultaneously, Dr. Dericioglu is leading the R&D department and projects of Asil Çelik, the largest quality steel producer of Turkey. His active research topics are Heat Treatment and Phase Transformations, Additive Manufacturing (3D Printing) of Metallic Materials, Microwave Processing (Ceramics and Metals) and Electromagnetic Interference Shielding and Radar Absorbing Materials/Composites.

Abstract:

Material development activities at Asil Çelik concentrate on novel grade design or modification to improve the efficiency of the process chain for the semi-finished rolled products or forged final components while reducing the overall environmental impact. In this presentation, a newly designed bainitic steel grade and its potential for industrial applications will be introduced.

Despite the increasing usage of non-ferrous materials such as aluminum, titanium and nickel-based alloys in various structural applications, steel remains important in demanding industries such as automotive, aviation and power generation, not only due to its relatively low cost but also due to the range of unique properties it can offer. As it is the case with all metallic and non-metallics engineering materials, reducing the carbon footprint of the process chain from refining to semi-finished/finished products is of high priority for the steelmaking.

This can be achieved by improving the efficiency of the processes and using carbon-neutral raw materials and/or energy sources, while eliminating the energy-intensive steps of the process chain. Heat-treatable steels are occupying a remarkably large usage volume in almost all engineering applications. In addition to the whole carbon-intense process cycle of steelmaking, such steels do require a final heat treatment step considerably increasing the carbon footprint of the final product. Bainitic steels, which can reach to the mechanical properties of the heat-treatable steels by just controlled cooling at the end of the process cycle of the semi-finished or final product. In this talk, the design of a novel low carbon bainitic (LCB) steel grade developed by Asil Çelik will be presented. Properties of this bainitic grade achieved by compositional adjustment and controlled cooling after hot-rolling, similar to those of some well-known heat-treated steel grades with higher alloying content, will be discussed. Additionally, component validation test results of a closed-die forged and controlled cooled automotive part made of this bainitic grade will be presented to demonstrate its availability for demanding applications. Consequently, the potential of the novel bainitic grade to improve the process chain and reduce environmental impact through decarbonization would be introduced.