

Manufacturing - An Integration Platform

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Abstract

Manufacturing is what translates ideas, innovation and raw materials into products that society uses, a driving force for raising living standards globally. Since the dawn of the industrial revolution, growth in manufacturing output is not proportional to population; instead, manufacturing productivity grows with innovation and consequently has become a primary indicator of a nation's competitiveness in science and technology. Manufacturing is thus a central feature of two major global transformations: the rise of emerging market economies dominating demand growth across all sectors, and the emergence of new manufacturing and business paradigms from the integration of cyber and physical systems. To enable the versatility of manufacturing processes and to fully integrate design and manufacturing for system optimization, at the Advanced Manufacturing Processes Laboratory of Northwestern, research efforts are rooted in discovering new processes and in enhancing the predictability of manufacturing processes using the ICME (integrated computational materials engineering) approach. This talk will provide an overview about those activities and then focus on selective processes and their fundamentals, which include rapid dieless sheet forming for producing three-dimensional sheet parts without geometry-specific tooling, metal-based powder-blown additive manufacturing, and laser processes for surface texturing.

Biography

Dr. Cao (MIT'95, MIT'92, SJTU'89) is the Cardiss Collins Professor, Director of Northwestern Initiative for Manufacturing Science and Innovation, and an Associate Vice President for Research (AVPR) at Northwestern University. She was at the National Science Foundation as a program director for two years. Professor Cao is an elected Fellow of American Association for the Advancement of Science (AAAS), ASME, SME, and the International Academy for Production Engineering (CIRP). Her major awards include Vannevar Bush Faculty Fellow from DoD (2019), Charles Russ Richards Memorial Award (2017) from ASME and Pi Tau Sigma, SME Frederick W. Taylor Research Medal (2016), ASME Blackall Machine Tool and Gage Award (2012, 2018), ASME Young Investigator Award (2006) from Applied Mechanics Division, and NSF CAREER Award. Prof. Cao is the Editor-in-Chief of Journal of Materials Processing Technology. She served as President of the SME North America Manufacturing Research Institute, and Chair of ASME Manufacturing Engineering Division. She is a recipient of ASME Dedicated Service Award (2011). As an AVPR, Prof. Cao fosters the collaboration between disciplines across and beyond Northwestern. She is a Board member of mHUB, Chicago's first innovation center focused on physical product development and manufacturing.