Modeling and Control of Advanced Roll-to-Roll Manufacturing Systems

Prabhakar R. Pagilla
TEES Professor, Department of Mechanical Engineering
Texas A&M University

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Abstract: Roll-to-Roll (R2R) manufacturing is an efficient and scalable method to manufacture many consumer products from flexible materials referred to as webs. R2R manufacturing has been traditionally used extensively in paper and sheet metal industries, and more recently in the production of flexible plastics and polymers. A significant increase in R2R manufacturing of flexible and printed electronics is expected in emerging applications such as displays, solar panels, optoelectronics, electronics, sensors, photovoltaics, and engineered surfaces.

This talk will focus on common R2R transport related issues encountered in processes such as printing, coating, and lamination that are necessary for traditional and emerging applications. This presentation will highlight the work performed in (1) dynamic modeling of key primitive elements of R2R systems and (2) design and experimental implementation of decentralized control systems on laboratory platforms and industrial production machines. The latter part of the presentation will discuss challenges in high precision R2R transport of flexible substrates and laminates in emerging applications.

Biography: Prabhakar Pagilla is a TEES Professor in the Department of Mechanical Engineering at Texas A&M University. He received the Ph.D. degree in Mechanical Engineering from the University of California, Berkeley, in May 1996. Prior to joining Texas A&M in August 2015, he served as the Centennial Professor of Engineering at Oklahoma State University, and a faculty researcher in the Web Handling Research Center. His formal background is in dynamic systems and control with applications in manufacturing and robotics. His research interests lie in modeling and control of roll-to-roll manufacturing systems, robotics/mechatronics, and control of large-scale nonlinear dynamic systems. He received a Regents Distinguished Research Award in 2012, a Halliburton Outstanding Faculty award in 2010, and an NSF CAREER Award in 2000. He served as a Technical Editor of the IEEE/ASME Transactions on Mechatronics and as an Associate Editor of the ASME Journal of Dynamic Systems, Measurement, and Control. He is a fellow of ASME and a member of SME and IEEE.