

## **Multiscale modeling and control of pulping process**

Prof. Joseph Kwon

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In this talk, Dr. Kwon will focus on the pulp and paper industry (PPI) which is undergoing a paradigm shift triggered by growing paper demand for e-commerce packaging paper due to the online shopping boom and by unprecedented megatrend toward hygiene products to reduce the risk of COVID-19. Despite the critical role of fiber morphology in dictating final paper quality, there exist fundamental knowledge gaps regarding (i) how fiber morphology as well as other microscopic properties are influenced by macroscopic variables, (ii) how fiber-to-fiber heterogeneity affects overall performance of a pulp digester, and (iii) how frequent product grade transitions can be mitigated to reduce economic loss. Dr. Kwon will fill these knowledge gaps utilizing novel multiscale models and two-tier control systems. Moreover, the proposed model identification and control approach will address one of the biggest challenges in Koopman-based control theory (i.e., obtaining a finite-dimensional closed-form linear approximation of nonlinear systems). The developed approach will accelerate manufacturing innovation in the U.S., especially in the PPI going forward. Specifically, it will lower break-even price with respect to paper by improving manufacturing efficiencies, reducing waste production and harmful emissions, and driving sustainable growth via efficient use of renewable resources.

### **Profile**

Dr. Joseph Kwon received his Ph.D. in Chemical Engineering from University of California, Los Angeles (UCLA) in 2015. Dr. Kwon joined the Department of Chemical Engineering at Texas A&M University as an Assistant Professor in 2015, and he has been appointed as (tenured) Associate Professor and holder of the Kenneth R. Hall Career Development Professorship in 2022. Dr. Kwon's research focuses on multiscale modeling, computation and control of chemical and biological processes with a specialization in oil and gas processes. He has received over \$3.3 million in external research funding from the NSF, DOE and chemical process companies. Dr. Kwon is an associate editor of two international journals, and is handling two special issues as guest editors. He has written more than 100 peer-reviewed journal articles, and was the plenary speaker at several international conferences, including AIChE annual meetings, in the area of process systems engineering. Dr. Kwon received the KICe President Young Investigator Award, Artie McFerrin Department of Chemical Engineering Distinguished Teaching Award, KSEA Young Investigator Award, TEES Young Faculty Fellow Award, Engineering Genesis Award, Hanhwa Non-tenured Faculty Award, and The IET Premium Award.