

Professor Erik Ydstie Carnegie Mellon University

Inventory and Flow Control in Complex Networks

In the Chair: Professor David Bogle FEng, Director,
Centre for Process Systems Engineering

Vote of Thanks: Dr Eva Sorensen, Centre for Process Systems
Engineering and University College London

Erik Ydstie is Professor of Chemical Engineering at Carnegie Mellon University. He received his BSc and MSc from the Norwegian Institute of Technology and his PhD in 1982 from Imperial College. Professor Ydstie applies control theory to processes of practical interest to the chemical manufacturing industries.

Professor Ydstie will speak about how accumulation and flow of inventory in supply chains, chemical plants and information systems (natural and artificial) are modeled using networks of distributed devices analogous to complex electrical circuits. Networks of this kind are called process networks. The conservation laws play the role of Kirchoff's current law. Concavity of the entropy function provides the basis for an analogue to the voltage law. Nonlinear systems theory furthermore says that strictly passive feedback when applied to a passive circuit automatically gives a current distribution which stabilizes so that the dissipation of heat is minimized. By making analogies amongst process control, network thermodynamics and business decision making it shows that distributed inventory and flow control leads to feedback systems that are agile and able to adapt as technologies develop and markets change. The supply chain for solar grade silicon production provides the benchmark illustration in this presentation. Other applications he has worked on include glass manufacture, automotive windshield production, silicon and aluminum smelting.

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The Thirteenth Professor Roger W.H. Sargent Lecture

The Professor Roger Sargent
Lecture is an annual event
the Centre for Process Systems
Engineering inaugurated as a
tribute to Professor Sargent's
vision, leadership, significant
technical contributions and
to his legacy in the field of
Process Systems Engineering.