

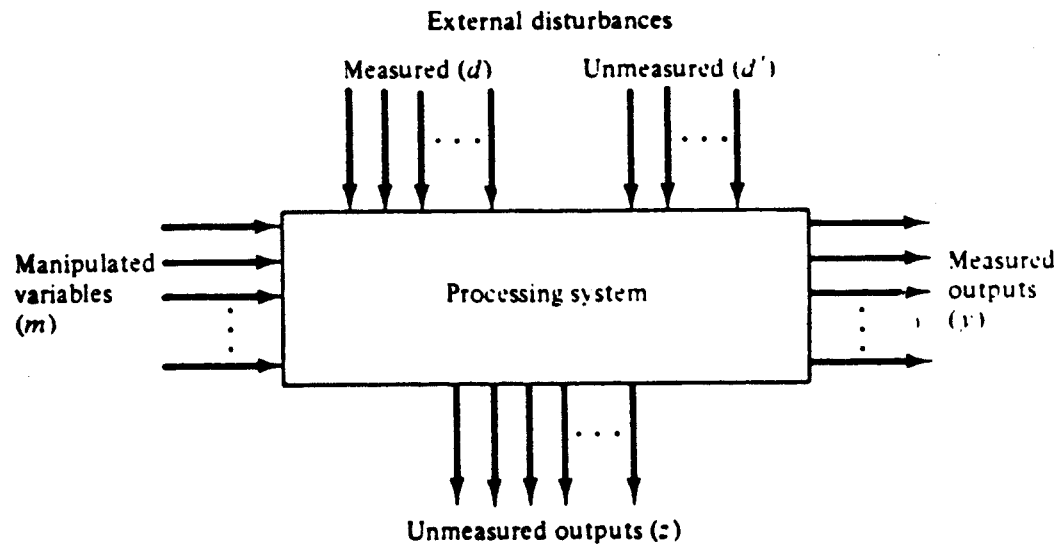
PROCESS MODELING AND CONTROL

T.F. Edgar

The Department of Chemical Engineering

The University of Texas at Austin

- What is process modeling and control
- Why improve the technology
- Process control research in our department



- Ensure safe plant operation
- Meet product specifications
- Optimize economic performance
- MIMO (vs. SISO) models
- Nonlinear (vs. linear) models
- Stochastic variables
- Large number of variables

- Control System Monitoring and Diagnosis
- Dynamic Modeling of Chemical Processes
- Materials Processing
- Dynamic System Identification
- NMPC and Moving Horizon Predictions
- Optimization Theory and Algorithms
- Statistical Process Monitoring/Fault Diagnosis

TWCCC - Multiple Projects

<u>Company</u>	<u>JBR</u>	<u>TFE</u>	<u>JQ</u>
Abbott Labs		√	√
AMD/Global Foundries		√	
Chemstations		√	
Chevron			√ √
Eastman	√		
ExxonMobil	√	√	
Emerson Proc. Mgt.		√	
Johnson Control			√
Praxair	√		√
Shell	√		
Texas Instruments		√ √	
Weyerhaeuser			√

Courting Air Liquide, Corning, Dow, Freescale, Honeywell, Inficon, Tokyo Electron

M.S., Ph.D. Graduates (2005 - 2008)

<u>Student/Supervisor</u>		<u>Destination</u>
E. Hale (JQ)	Ph.D. (8/05)	NREL
R. Chong (TFE)	M.S. (8/05)	AMD
L. Rueda (TFE)	Ph.D. (12/05)	Shell
S. Harrison (TFE)	Ph.D. (5/06)	AMD
D. Castineira (TFE)	Ph.D. (5/06)	Shell
C. Harrison (JQ)	Ph.D. (5/06)	Marathon Oil
A. Venkat (JBR)	Ph.D. (5/06)	Shell
K. Chamness (TFE)	Ph.D. (12/06)	Spansion (AMD)
G. Cherry (JQ)	Ph.D. (12/06)	AMD
T. Farmer (TFE)	Ph.D. (5/07)	Capital One
J. Yu (JQ)	Ph.D. (5/07)	Shell
P. Larsen (JBR)	Ph.D. (7/07)	Dow
E. Mastny (JBR)	Ph.D. (7/07)	BP Alaska
M. Rajamani (JBR)	Ph.D. (10/07)	BP
C. Schoene (JQ)	Ph.D. (12/07)	Multiphase Solutions
Y. Cai (JQ)	Ph.D. (8/08)	Freescale
A. Prabhu (TFE)	Ph.D. (8/08)	Air Liquide

M.S., Ph.D. Graduates (2008 – 2011)

<u>Student/Supervisor</u>		<u>Destination</u>
H. Lee (TFE)	Ph.D. (8/08)	Intel
Y. Zhang (TFE)	Ph.D. (8/08)	ExxonMobil
D. Thiele (TFE)	Ph.D. (5/09)	Emerson
D. Weber (TFE)	Ph.D. (8/09)	Shell Oil
S. Abrol (TFE)	Ph.D. (8/09)	General Electric
B. Parkinson (TFE)	M.S. (8/09)	Tokyo Electron
B. Stewart (JBR)	Ph.D. (8/10)	Exxon-Mobil
B. Bregenzer (JQ)	Ph.D. (08/11)	Interviewing
Q. Shen (JQ)	Ph.D. (12/10)	Multiphase Solutions
E. Joag (TFE)	M.S. (12/10)	Interviewing
N. Patwardhan (TFE)	M.S. (12/10)	Volterra
C. Alcalá (JQ)	Ph.D. (5/11)	Interviewing
I. Castillo (TFE)	Ph.D. (5/11)	Interviewing
D. French (TFE)	Ph.D. (8/11)	Interviewing
B. Gill (TFE)	Ph.D. (8/11)	Interviewing
B. Spivey (TFE)	Ph.D. (8/11)	ExxonMobil
S. Ziaii (TFE)	Ph.D. (8/11)	Interviewing

Edgar Group Project Areas

- Multivariable Control/Estimation
- Semiconductor Manufacturing Monitoring and Control
- Optimization of Petroleum Reservoir Production
- Flue Gas CO₂ Removal Strategies (Modeling, Control, Optimization)
- Model-based Fault Detection
- Diabetes Closed-loop Control
- Optimization and Control of Energy Systems
- Flare Combustion Modeling

Multivariable Control and Estimation

- D. French – Wireless feedback control (Emerson Process Management)
- J. Lee (postdoc) – Various topics in multivariable control (e.g., multiloop PI controller design, interaction analysis)
- I. Castillo – Fundamental model-based fault detection (Roberto Rocca Fellowship and PSTC)
- R. Palma – Dynamic modeling of blood glucose in Type 2 diabetes (joint with Adam Heller, NSF Fellow, and Abbott Labs)

Semiconductor Manufacturing Modeling/Control

- B. Gill – Virtual sensors in etch processes (Texas Instruments)
- X. Jiang – Controller performance monitoring in multiproduct manufacturing (NSF grant, Texas Instruments)

Energy Projects

- A. Nguyen and J. Kim – Petroleum reservoir production optimization (Joint with Larry Lake – Oil Company Consortium)
- S. Ziaii – CO₂ absorption process modeling and control/power plant energy integration (Joint with Gary Rochelle – U.S. DOE and UT Carbon Management Consortium)
- K. Kapoor – Semiconductor facility energy management (Texas Instruments)
- B. Spivey – Fundamental model-based control of fuel cell power systems (ExxonMobil)
- K. Powell – Optimization of thermal energy storage (NSF Fellow)
- W. Cole – Smart Grids and Combined Heat/Power – Pecan Street Project (DOE)
- A. Sriprasad – Smart Grid Behavioral Modeling – Pecan Street project NSF IGERT