Curriculum Vitae

David Edwards Clough

Professor
Department of Chemical and Biological Engineering
University of Colorado
Boulder, CO 80309-0596

Phone: 303-492-6638
Mobile: 303-968-5403
FAX: 303-492-4341
Email: David.Clough@Colorado.edu

Education

PhD, Chemical Engineering, University of Colorado, 1975
MS, Chemical Engineering, University of Colorado, 1969
BS, Chemical Engineering, Case Institute of Technology[1], 1968
Study Abroad, Instituto Tecnológico y de Estudios Superiores de Monterrey, 1966-67

Industrial Experience

Chemical Engineer, Instrumentation Consulting Group, Engineering Service Division, Engineering Department, E. I. du Pont de Nemours and Co., Inc., 1969-1972.

Academic Experience

Assistant Professor, Dept of Chemical Engineering, University of Colorado, 1975-1980
Associate Professor, Dept of Chemical Engineering, University of Colorado, 1980-1987
Professor, Dept of Chemical Engineering, University of Colorado, 1987-present

Adjunct Professor, Dept. of Chemical Engineering, University of Massachusetts, Amherst, 1982
Visiting Professor, Dept. of Chemical Engineering, Norwegian University of Science and Technology (NTNU), Trondheim, 1999-2000
Visiting Erskine Fellow, University of Canterbury, Christchurch, New Zealand, 2006
Visiting Professor, Monash University, Melbourne, Australia, 2007

Administrative Positions Held

Associate Dean for Academic Affairs, College of Engineering and Applied Science, University of Colorado, 1986-1992
- originated the concept for the Integrated Teaching and Learning Laboratory and helped launch the 8-year project that led to opening the facility in 1997

Associate Chair, Dept of Chemical Engineering, University of Colorado, 1992-1999
Acting Chair, Dept of Chemical and Biological Engineering, University of Colorado, AY 2005-2006
Faculty Athletics Representative, University of Colorado, Boulder Campus, 2005-present

[1] Since 1968, Case Western Reserve University, Cleveland, Ohio

Awards

Boulder Faculty Outstanding Teaching Award, University of Colorado, 1980
Hutchinson Teaching Award, University of Colorado, 1985
Max S. Peters Service Award, University of Colorado, 1993
ASEE Rocky Mountain Section Outstanding Educator, 1996
Outstanding Advisor Award, University of Colorado ,1996
Sullivan Carlson Inspiration in Teaching Award, University of Colorado, 1998
Distinguished Engineering Alumnus Award, University of Colorado, 2000
Robert L. Stearns Award, Alumni Association, University of Colorado, 2008

University Courses Taught

at the University of Colorado

1. Instrumentation and Process Control (CHEN 4570), 32 offerings from 1975 to present
   - 3 laboratory exercises developed in late 70's
   - 15-session laboratory component developed in mid-90's
   - traditional lecture component of course converted to active-learning format in late 90's
   - 44 cooperative active-learning workshops developed
   - optional design-and-build semester projects

2. Applied Data Analysis (CHEN 3010), 5 offerings from 1995 to present
   - traditional lecture course converted to cooperative active-learning format in 1995
   - 28 hands-on statistical/measurements workshops developed

3. Digital Computer Process Control (CHEN 5570), 8 offerings from late 70's through the 90's
   - introduced laboratory exercises as a form of homework in this graduate-level course
   - students developed and implemented advanced control on lab pilot plant units

4. Chemical Engineering Laboratory (CHEN 4030), 4 offerings since 1970's
   - implemented significant renovations and new experimental units in 70's, 80's and 90's
   - added computer data acquisition to most experimental units in the 90's

5. Introduction to Engineering Computing (GEEN 1300), 17 offerings from 1987 to present
   - course developed with Chapra in late 80's for all CE, ChE, Aero, ArchE, EnvE, and ME freshmen
   - reduced lecture meetings and introduced hands-on workshop

6. Engineering Projects (GEEN 1400), 1 offering in 1994
   - developed, with Prof. L. Carlson, this freshman hands-on, design-and-build course
   - 12 sections/year now offered to 250 students in Engineering at Colorado
   - track record of increased retention of students at risk

7. Applied Statistics in the Manufacturing and Process Industries (MCEN 5126), 4 offerings since 1990
   - graduate course extended to local industry via live TV instruction
   - experimental demonstrations integrated into class broadcasts

8. Applied Statistics in Research and Development (CHEN 5128), 5 offerings since 1997
   - graduate course extended to local industry via live TV instruction
   - students complete experimental term project involving design of experiments

9. Process Modeling and Computer Simulation (CHEN 4580), 10 offerings
   - course renovated in Spring 2012, Matlab-based

10. Introduction to Chemical Engineering (CHEN 1300), 5 offerings since the early 90's
    - one-credit-hour introductory course for freshmen developed in early 90's
    - includes field trips to local industry to observe ChEs and follow-up oral presentations

11. Energy Fundamentals -- Global and Future Perspectives (CHEN 4838), 1 offering in 2007
    - technical elective with broad coverage of energy technology
    - includes student projects where groups focus on a specific technology

12. Numerical Methods in Chemical Engineering (CHEN 5750)
    - course renovated in Spring 2012, Matlab-based

13. Undergraduate Seminar (CHEN 4090), Fall 2011
    - integrated ethics component into the course

at Instituto Tecnológico y de Estudios Superiores (ITESM), Monterrey, Mexico

12. Digital Computer Process Control, with S. Rivera, taught in Spanish, 1987
    - students completed experimental project as part of this graduate course

at University of Massachusetts

13. Computer Process Control, 1982
    - students completed homework assignments using on-line microcomputer with laboratory heat exchanger system

at Norwegian University of Science and Technology (NTNU – Trondheim)

14. Process Design, 2000
    - sponsored design projects for three student groups
    - introduced the use of dynamic process simulation (HYSYS.Plant)

at Monash University, Melbourne, Australia

15. Financial Analysis and Project Management for Chemical Engineers, 2007
    - students analyzed financial statements of Australian companies
    - students completed an economic project analysis for residential wind power

Instruction to Professionals – Short Courses

1. *Spreadsheet Power for Chemical Engineering Calculations*, with F. M. Julian, AIChE/ASME, 2-day short course, 108 offerings from 1989 to present.

2. *Excel Programming with VBA*, with F. M. Julian, AIChE/ASME, 1-day short course, 25 offerings from 2002 to present.

3. *Batch Processing for the Chemical and Pharmaceutical Industries*, with R. M. Felder and G. S. Huvard, 4-day short course, Center for Professional Advancement, 17 offerings, 1986 to present.

4. *Computer Control of Processes*, with W. F. Ramirez, R. C. Johnson and T. M. Stout, 5-day short course, University of Colorado, 30 offerings, 1968 to 1980.

Educational Grants

1. *Minicomputer Data Acquisition System for the Chemical Engineering Undergraduate Laboratory*, NSF, 1977, $40,000.

2. *New Experimental Units for the Chemical Engineering Undergraduate Laboratory*, with W. F. Ramirez and L. F. Brown, State of Colorado, 1980, $90,000.

3. *Distributed Computing Network for the Chemical Engineering Research and Undergraduate Laboratories*, with W. F. Ramirez, NSF, 1980, $100,000.

4. *The Integration of Emerging Computer Technology into Classroom Instruction in Engineering at the University of Colorado – the Zenith Instructional Project (ZIP)*, Zenith Data Systems and Microsoft, 1991, $42,000.

5. *Improvements to the Chemical Engineering Undergraduate Laboratory*, Undergraduate Excellence Fund, College of Engineering and Applied Science, University of Colorado, 1995, $21,400.

6. *Software Complement for the Borgmann Computing Laboratory, Undergraduate Excellence Fund*, College of Engineering and Applied Science, University of Colorado, 1995, $15,000.

7. *Fluid-flow Experimental Module for Instruction in Differential Equations*, Undergraduate Excellence Fund, College of Engineering and Applied Science, University of Colorado, 1996, $4,000.

8. *Introduction of PLCs into the Instrumentation and Process Control Course (CHEN 4570)*, Engineering Excellence Fund, College of Engineering and Applied Science, University of Colorado, 1998, $5,000.

9. *Computational Methods Throughout the Chemical Engineering Curriculum*, with V. Barocas, Engineering Excellence Fund, College of Engineering and Applied Science, University of Colorado, 1998, $6,000.

10. *Instrumentation for Use in Process Control Course (CHEN 4570)*, Winn Marion Corporation, 1998, $15,000.

11. *Acquisition of HYSYS Chemical Process Simulator*, with A. W. Weimer, Engineering Excellence Fund, College of Engineering and Applied Science, University of Colorado, 2001, $6,000.

12. *Experimental Modules for Fluids, Heat Transfer and Differential Equations*, Engineering Excellence Fund, College of Engineering and Applied Science, University of Colorado, 2001, $3,540.

13. *Enhanced Measurement Devices for Applied Data Analysis (CHEN 3010)*, Engineering Excellence Fund, College of Engineering and Applied Science, University of Colorado, 2001, $1,225.

14. *Hy-Cell: Hands-on Fuel Cell Experience for Undergraduates*, Engineering Excellence Fund, College of Engineering and Applied Science, University of Colorado, 2008, $14,515.

15. Programmed Logic Controller (PLC) Laboratory Experiment for CHEN 4570 – Instrumentation and Process Control, Engineering Excellence Fund, College of Engineering and Applied Science, University of Colorado, 2008, $1,992.

Publications on Engineering Education

1. *The Integration of Laboratory Experience with a Senior Course in Chemical Process Instrumentation and Control*, Proc. Frontiers in Education Conference, Champaign-Urbana, p. 239, 1977.

2. *A New Approach to Introducing Freshman Students to Chemical Engineering*, Proc. 1995 ASEE Annual Conference, Anaheim.

3. *Revitalizing Statistics in the Chemical Engineering Curriculum*, Proc. 1997 ASEE Annual Conference, Milwaukee.

4. *A New Multipurpose Fluid-flow Experimental Module*, D. E. Clough, Proc. 1997 ASEE Annual Conference, Milwaukee.

5. *Bringing Active Learning into the Traditional Classroom: Teaching Process Control the Right Way*, Proc. 1998 ASEE Annual Conference, Seattle.

6. *A Change in Approach to Engineering Computing for Freshmen – Similar Directions at Three Dissimilar Institutions,* with S. C. Chapra and G. S. Huvard, Proc. 2001 ASEE Annual Conference, Albuquerque.

7. *ChE's Teaching Introductory Computing to ChE Students – A Modern Computing Course with Emphasis on Problem Solving and Programming*, D. E. Clough, 2002 ASEE Annual Conference, Montreal.

8. *The Missing Link in Process Control Education – Incorporating PLC's Into the ChE's Control Course*, D. E. Clough, 2002 ASEE Annual Conference, Montreal.

Selected Presentations on Engineering Education (last 10 years)

1. *Faculty Teaching Performance Assessment*, Workshop for Associate Deans, 1991 ASEE Annual Conference, Toledo.

2. *Spreadsheet Software in Chemical Engineering Education – An Effective Pedagogical Tool*, AIChE Annual Meeting, Miami Beach, 1992.

3. *Integrating Statistics into the Chemical Engineering Curriculum*, AIChE Annual Meeting, St. Louis, 1993.

4. *Evolution of an Introductory Computing Course Responsive to the Needs of Freshman Students*, with S. C. Chapra, ASEE Rocky Mountain Section Annual Conference, Boulder, 1994.

5. *Live Data Acquisition of Spreadsheets in a Windows Environment*, AIChE Annual Meeting, San Francisco, 1994.

6. *Formación del Profesor*, national conference of ChE department chairs, IMIQ, Monterrey, Mexico, 1995.

7. *The Role of Graphical Programming in the ChE Curriculum*, AIChE Annual Meeting, Chicago, 1996.

8. *ASEE: A Multifaceted Resource for Young Faculty*, AIChE Annual Meeting, Los Angeles, 1997.

9. *Let Them Eat C!*, with S. C. Chapra, ASEE Rocky Mountain Section Annual Conference, Logan, UT, 1997.

10. *Process Control Education in the New Millenium – Teaching in a Cooperative and Active-Learning Environment*, Nordic Process Control Conference, Copenhagen, 2000.

11. *Teaching Process Unit and Plant-wide Control Strategies Using Process Simulators in Chemical Engineering*, AIChE Annual Meeting, Los Angeles, 2000.

12. *The Integration of Dynamics and Control into Design Project Using Commercial Process Simulators*, with A. Weimer, AIChE Annual Conference, Los Angeles, 2000.

13. *In with the new, but not quite out with the old – Introductory computing for engineers at the University of Colorado*, ASEE Rocky Mountain Section Annual Conference, Salt Lake City, UT, 2001.

14. *A Change in Approach to Engineering Computing for Freshmen – Similar Directions at Three Dissimilar Institutions*, with S. C. Chapra and G. S. Huvard, Proceedings of the 2001 Annual Conference of the American Society for Engineering Education, Albuquerque, June, 2001.

15. *ChE's Teaching Introductory Computing to ChE Students – A Modern Computing Course with Emphasis on Problem Solving and Programming*, Proceedings of the 2002 Annual Conference of the American Society for Engineering Education, Montreal, June, 2002.

16. *The Missing Link in Process Control Education – Incorporating PLC's into the ChE's Control Course*, Proceedings of the 2002 Annual Conference of the American Society for Engineering Education, Montreal, June, 2002.

17. *Toward A Kinder, Gentler ABET*, Proceedings of the 2004 Annual Conference of the American Society for Engineering Education, Salt Lake City, June, 2004. Selected as the outstanding paper from ASEE Zone IV in 2003.

18. *Active-learning Techniques in Chemical Engineering Education*, Proceedings of CHEMECA, Auckland, New Zealand, September, 2006.

<u>Presentations on Intercollegiate Athletics</u>

1. *The FAR's Challenge in Dealing with Multiple Constituencies on Campus*, Panel Presentation, Faculty Athletics Representatives Association (FARA), Baltimore, November, 2007.

2. *Strategies for Analyzing and Predicting APR and for Enhanced Communication with Coaching Staffs*, NCAA Convention, Nashville, 2008.

3. with Carrie Leger, NCAA, *Academic Progress Rate (APR) Improvement Plans -- Campus Best Practices and Strategies for Collaboration*, NACADA/NCAA Academic Institute, Portsmouth, VA, June, 2008.

4. with Ken Provitt, Alabama A&M University, *Collaborating with your Faculty Athletics Representative and Compliance Officer*, NACADA/NCAA Academic Institute, Portsmouth, VA, June, 2008.

5. with Tomas Jimenez, Louisiana State University, *Recruiting by the Numbers*, NACADA/NCAA Academic Institute, Portsmouth, VA, June, 2008.

6. *APR & Recruiting – Working with Coaches to Connect the Dots*, D1A FARs Meeting, Dallas, TX, September, 2008.

7. *Strategic Tools for APR – Communicating with your Coaching Staffs*, FARA 2008 Annual Meeting and Symposium, San Diego, CA, November, 2008.

Research Publications

1. *Stability of Tubular Systems*, M.S. Thesis, University of Colorado, 1969.

2. *Stability of Counter-current and Parallel-flow Heat Exchangers with and without Diffusive Effects*, with W. F. Ramirez, Proc. JACC, Atlanta, 1969, p. 596.

3. *Local Stability of Tubular Reactors*, with W. F. Ramirez, Proc. IFAC Symposium on the Control of Distributed Parameter Systems, Banff, 1971, p. 11-5.

4. *Stability of Tubular Reactors*, with W. F. Ramirez, Simulation, 16, #5 , p. 207, 1971.

5. *Local Stability of Tubular Reactors*, with W. F. Ramirez, AIChE J, 18, #2, p. 393, 1972.

6. *Optimization and Control of the Dehydrogenation of Ethylbenzene to Form Styrene*, Ph.D. Dissertation, University of Colorado, 1975.

7. *Mathematical Modeling and Optimization of a Styrene Pilot Plant*, with W. F. Ramirez, Proc. Summer Computer Simulation Conference, San Francisco, 1975.

8. *Control Systems for Unusual Process Conditions*, with W. F. Ramirez, Chemical Process Control, AIChE Symposium Series, 72, p. 159, 1976.

9. *Mathematical Modeling and Optimization of the Dehydrogenation of Ethylbenzene to Form Styrene*, with W. F. Ramirez, AIChE J, 22, #6, p. 1097, 1976.

10. *On-line Estimation and Identification of a Nonlinear, Distributed-parameter Process: The Dehydrogenation of Ethylbenzene to Form Styrene in a Tubular, Fixed-bed, Catalytic Reactor*, with W. F. Ramirez, Colloques IRIA, Textes de Communications, Analyse de Systemes et ses Orientations Nouvelles, Versailles-Rocquencourt, p. 91, 1976.

11. *Computational Problems in the Determination of Control Policies for Batch Polymerization*,
with P. M. Masterson and S. R. Payne, Proc. of 1978 Summer Computer Simulation Conference, Newport Beach, p. 279, 1978.

12. *Systems Operations, Management and Program Documentation*, Chapter 16, Real Time Computing, D. A. Mellichamp, Ed., Van Nostrand-Reinhold, 1982.

13. *A Critical Evaluation of the Semi-implicit Runge-Kutta Methods for Stiff Systems*, with A. W. Weimer, AIChE J, 25, #4, p. 730, 1979.

14. *Dynamics of Particle Size/Conversion Distributions in Fluidized Beds: Application to Char Gasification*, with A. W. Weimer, Powder Tech., 26, #1, p. 11, 1980.

15. *Modeling of Char Particle Size/Conversion Distributions in a Fluidized Bed Gasifier: Non-isothermal Effects*, with A. W. Weimer, Powder Tech., 27, #1, p. 85, 1980.

16. *Modeling a Low Pressure Steam-oxygen Fluidized Bed Coal Gasifying Reactor*, with A. W. Weimer, Chem. Eng. Sci., 36, #3, p. 549, 1981.

17. *Distributed Parameter Estimation and Identification for Systems with Fast and Slow Dynamics*, with N. Kuruoglu and W. F. Ramirez, Chem. Eng. Sci., 36, p. 1357, 1981.

18. *The Influence of Jetting-Emulsion Mass and Heat Interchange in a Fluidized Bed Coal Gasifier*, with A. W. Weimer, AIChE Symposium Series: Recent Advances in Fluidization and Fluid Particle Systems, D. Punwani, Ed., 77, #205, p. 51, 1981.

19. *Stochastic Growth of Phycomyces Sporangiophores*, with R. I. Gamow, Foundations of Biochemical Engineering: Kinetics and Thermodynamics in Biological Systems, ACS Symposium Series 207, p. 403, 1983.

20. *On the Rise Velocity of Slugs in Fluidized Beds*, with A. W. Weimer, Chem. Eng. Commun., 21, #1-3, p. 175, 1983.

21. *An Improved Bubble Velocity Equation for Bubbling Fluidized Beds*, with A. W. Weimer, AIChE J, 29, #3, p. 411, 1983.

22. *Time-Dependent Behavior of Bubble Volume in Fluidized Beds*, with A. W. Weimer, I&EC Fund., 24, #2, p. 235, 1985.

23. *Use of a Distributed Computer System for Tubular Reactor Profile and Catalyst Activity Identification*, with N. Kuruoglu and W. F. Ramirez, AIChE J, 31, #2, p. 339, 1985.

24. *Real-Time Estimation of Dynamic Particle-Size Distributions in a Fluidized Bed: Theoretical Foundation*, with D. J. Cooper, AIChE J, 31, #7, p. 1202, 1985.

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25. *Steady-State Sequential Distributed Parameter Filtering to Estimate Temperature and Composition Profiles of a Fixed-Bed Tubular Catalytic Reactor*, with N. Kuruoglu and W. F. Ramirez, Chem.Eng.Sci., 40, #8, p. 1441, 1985.

26. *Experimental Tracking of Particle-Size Distributed in a Fluidized Bed*, with D. J. Cooper, Powder Tech., 44, #2, p. 169, 1985.

27. *Comparison of a Linear Distributed-Parameter Filter to Lumped Approximants*, with D. J. Cooper and W. F. Ramirez, AIChE J, 32, #2, p. 186, 1986.

28. *Optimal Real-Time Monitoring of Particle-Size Distribution in a Fluidized Bed*, with D. J. Cooper and W. F. Ramirez, AIChE J, 32, #3, p. 389, 1986.

29. *State Estimation of Bubble Frequency and Velocity in a Bubbling Fluidized Bed*, with D. C. Gyure, Chem.Eng.Commun., 46, #4-6, p. 365, 1986.

30. *Dynamic Estimation of Bubble Parameters in a Fluidized Bed Subjected to Load Disturbances*, with D. C. Gyure, I&EC Fund., 26, #5, p. 938, 1987.

31. *Spreadsheet Control of a Distillation Tower*, Chem.Eng.Prog., 11, #85, p. 17, 1989.

32. *Control of Interacting Gates on Main Irrigation Canals*, with B. Zhou, Proc. 1995 American Control Conference, Seattle.

33. *Intrinsic Kinetics for Rapid Decomposition of Methane in an Aerosol Flow Reactor*, with J. K. Dahl, V. H. Barocas, and A. W. Weimer, Int'l J. of Hydrogen Energy, 27, 377-386, 2001.

34. *Adaptive Generalized Predictive Control*, with E. M. Bergheim, Proceedings of ISA 2001 Annual Conference and Exposition of the Instrumentation, Systems and Automation Society, Houston, TX, September 11, 2001.

35. *Hydrogen Production through Solar-thermal Processing*, with A. W. Weimer, Proceedings of CHEMECA, Auckland, New Zealand, September, 2006.

Graduate Research Supervision

Doctoral

1. Alan W. Weimer, *An Experimentally-verified Mixture-Flux Model for Time-dependent Behavior of Bubbling Fluidized-bed Hydrodynamics: Char Gasification Dynamics*, 1980.

2. Necdet Kuruoglu, *On-line Distributed Parameter Estimation and Identification of a Tubular, Packed-bed, Catalytic Reactor to Form Styrene*, 1982, joint supervision with W. F. Ramirez.

3. Dale C. Gyure, *State Estimation and Control of a Bubbling Fluidized Bed*, 1984.

4. Douglas J. Cooper, *Optimal, Real-time Estimation of Particle-size Distributions in a Fluidized Bed*, 1985.

5. David C. Hogenson, *Adaptive Multivariable Receding-horizon Control: Application to a Distillation Column*, 1986.

6. Wayne S. Gaafar, *Optimal Estimation Algorithms for Systems with Multiple Time Modes and Delayed Measurements*, 1987, joint supervision with W. F. Ramirez.

7. Lawrance Flach, *Modeling of the Attrition Process in a Fluidized Bed Using On-line Measurements of the Particle-size Distribution*, 1988.

8. Edith A. Zagona, *Model-Predictive Control of Automated Canals*, 1992.

9. Mitesh Shah, *A Comparative Investigation of Novel and Traditional Separation Techniques*, joint supervision with R. Noble, 2006.

10. Maria Elizabeth Saade Saade, *Model Predictive Control of Solar Thermal Gasification of Biomass*, joint supervision with A. Weimer, 2008, in progress.

Master of Science

1. Denis E. Martin, *Computer Control of an Environmental Chamber*, 1976.

2. John P. Jarrell, *Design and Operation of a Multi-steam-port Styrene Reactor*, 1976.

3. Jean-Luc Renaud, *Identification of Distillation Column Tray Efficiency*, 1977.

4. P. Michael Masterson, *The Time-optimal Control of a Batch Polymerization Process*, 1977.

5. Alan W. Weimer, *Mathematical Modeling of a Low-pressure Steam-oxygen Fluidized-bed Coal-gasifying Reactor*, 1978.

6. Sheila R. Payne, *Fluidized Bed Combustion: A Dynamic Mathematical Model*, 1978.

7. John L. Robertson, *Control of Fluidized Beds: Direct Denitrator and Fluidization Quality*, 1979.

8. Felix Grossberg, *Construction and Implementation of a Distributed-intelligence Process-computer System for Chemical Engineering Research*, 1980.

9. J. David Lovece, *Application of a Multivariable Self-tuning Regulator to Control of a Distillation Tower*, 1980.

10. Douglas E. Miller, *A Microcomputer-based Multivariable Controller with Flexible Implementation Scheme*, 1981.

11. J. Elliotte Martin, *Multivariable Control of a Distillation Column Using Inverse and Direct Nyquist Array Techniques*, 1981.

12. Dale C. Gyure, *A Stochastic Approach to Fluidized State Control*, 1981.

13. Alexander Nothaft, *Process Identification and Self-tuning Regulators Applied to Distillation Control*, 1982.

14. David C. Hogenson, *A Robust Adaptive Proportional-Integral Controller*, 1983.

15. Michael D. Michonski, *Dynamic Modeling and Simulation of a Fluidized Bed Coal Gasification Process*, 1984.

16. Robert A. Moore, *On-line Estimation of Distillation Column Tray Efficiency*, 1984.

17. Seu-Jeung Park, *An Adaptive Dead-time-compensating Self-tuning Regulator*, 1985.

18. Philip Morrow, *Use of an Expert System to Change Process Model Structures for Control of a CFSTR in Real Time*, 1988.

19. Jean M. Boyer, Design and Simulation of Strippers for the Removal of Volatile Organics from Contaminated Groundwaters, 1988.

20. Bo Zhou, *Control of Interacting Gates on Main Irrigation Canals*, 1994.

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