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Dr. Fowler

Dr. Harvey

Thursday, March 13, 2025, 6:00 PM

”Diamond Shamrock Battleground Evaporator Startup with Fortran Simulation”

ABSTRACT: Very few of us can remember those stone age days of chemical engineering before there were fax and Xerox machines, PC’s, cell phones, email, the internet and even Word, Excel and PowerPoint. Yet it was back in those very days of 1973 when two intrepid Chem E’s attempted to create a relatively sophisticated dynamic simulation for an extremely complex chemical plant essentially from scratch using Fortran IV. The plant was Diamond Shamrock’s new steam fired quadruple effect caustic evaporation plant (with a fifth flash effect) called Battleground in LaPorte, Texas. Steam flowed 1-2-3-4-flash, but the liquor flowed 1-3-4-2-flash with a centrifuge to remove precipitated salt at the second effect. There were PI level controllers on the 4 effects, a flow controller on the steam, and a PID concentration controller on the flash effect.

To our knowledge, no one had ever designed such a plant before back then, much less operated one. Would its operation be stable? Would it really produce the desired product—a 50% aqueous caustic solution from aqueous “cell liquor” containing about 10% caustic and 10% salt? Could it even be started? Exactly how? Diamond was rolling the multimillion $ dice on this plant, and we were to be the guarantors of a favorable roll.

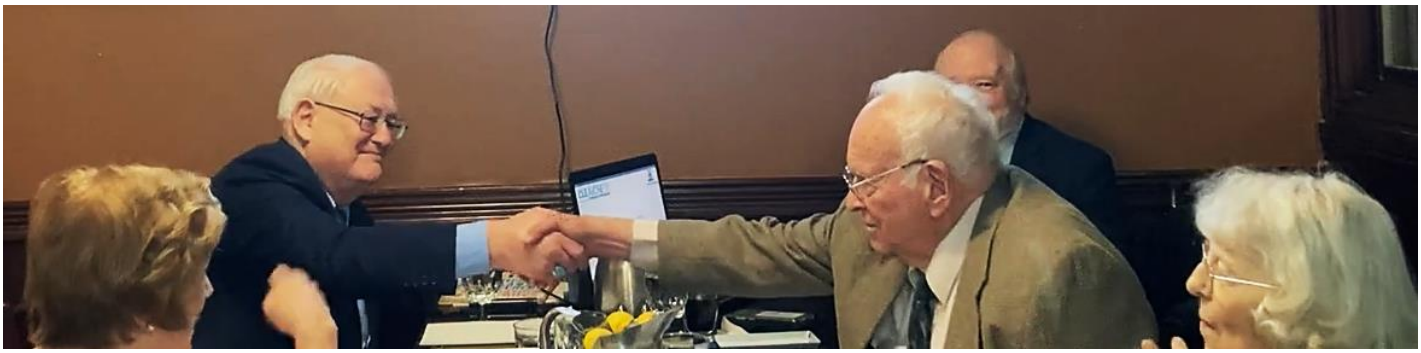
The only two tools available for answering these questions were an IBM System/360 model 44 mainframe and Roger Franks’ textbook *Modeling and Simulation in Chemical Engineering*. There were no other suitable “canned” software packages available for use at the time. The IBM mainframe lived up well to its middle name but was clumsy at best and often problematic for engineering use. Franks’ textbook contained rudimentary software for numerical integration, convergence, stream mixing or splitting, etc., which guided our initial efforts but often failed from the stresses caused by the plant’s complexity.

The talk to be given by Bob Fowler and Don Harvey goes into some detail about the nature of the problem and goes into the history of how the available tools were employed in an attempt to answer those nagging questions posed by the new and complex chemical plant.

BIOGRAPHIES:

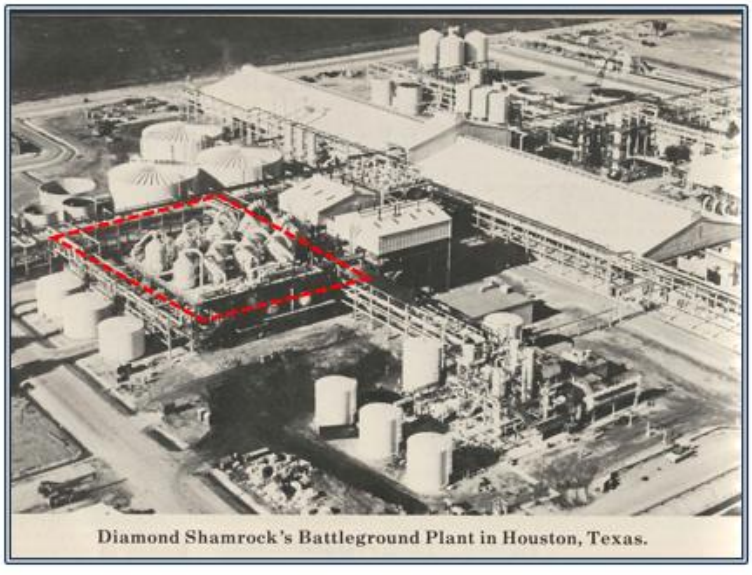
Dr. J. Robert Fowler received a BCHE from the University of Louisville and an MS in Biochemical Engineering and a PhD in Chemical Engineering, both from the University of Toledo. Dr. Fowler joined the Diamond Shamrock Chemicals Company as a Principle Advanced Applications Engineer in 1973. There Bob and a colleague, Dr. Donald J. Harvey, created a software package in Fortran IV that simulated the performance of the corporation's complex and advanced quadruple effect caustic evaporation plant which was under construction near Houston, TX. During a two-year period while construction continued, they created this dynamic simulator for startup and steady state performance purposes. The one-shift startup saved Diamond Shamrock an **estimated $60M** (1974) considering startup and construction costs. In 1986 when Diamond Shamrock was sold, Bob began work as a Senior Engineer at Sverdrup Technology as a Federal Contractor with the NASA Lewis Research Center in Cleveland, Ohio where he created a software package for physical properties of chemical fluids which is still used throughout NASA. In 1989, Bob was promoted to Director of Aerospace Technology with Sverdrup Technology/Nyma Corp. In 1999, he was appointed Program Manager with the Gilcrest Group, another Federal Contractor with NASA Glenn Research Center, where he turned around a contract for the engineering, operations, and maintenance of heavy equipment for aerospace testing including wind tunnels from a dysfunctional to an efficient operation. NASA HQ awarded the Gilcrest Group the prestigious "Minority Contractor of the Year" Award in Washington, D.C. for this and other services. At the conclusion of this contract Bob served as Vice President and general Manager for a small business supplying catalysts to the chemical industry. He retired from that position in 2004. He now serves volunteer positions as Chairman of the ADAMHS Board of Cuyahoga County and as Chairman of the ACS Cleveland Section's National Chemistry Week Program.

Dr. Donald J. Harvey received a BS in Chemical Engineering, MS in Mathematics, MS in Chemical Engineering, and a PhD in Chemical Engineering, all from the University of Michigan. Dr. Harvey joined Cleveland State University as an Assistant Professor in 1968. He taught nearly every course in the undergraduate chemical engineering curriculum (Material and Energy Balances, Thermodynamics, Transport I and II, Chemical Kinetics, Physical Chemistry, Unit Operations Lecture and Lab, Process Control, Numerical Methods) as well as graduate courses (Reactor Design, Engineering Thermodynamics, Dynamic Computer Simulation). While at CSU, Dr. Harvey developed a dynamic simulation of a quad-evaporative system for caustic production for the Diamond Shamrock Chemical Company, which then hired him away from CSU in 1977. In 1985, he moved from Diamond Shamrock to Lubrizol, where he worked on the simulation of kinetics and plant operations in their pilot plant. He stayed at Lubrizol until his retirement in 1996. He resides in Mentor, Ohio, with his wife of 59 years, Carol Harvey. In 2017 Dr. Harvey was recognized and honored with the Annual Bell Lectureship at the Cleveland State University by the Chemical and Biomedical Engineering Department Washkewicz College of Engineering.



(L-R) MIKE GALGOCZY (AICHE CHAIR) & BOB FOWLER

(L-R) JOE YURKO (AICHE NEWSLETTER ED.) & DON HARVEY



Diamond Shamrock's Battleground Plant in Houston, Texas.

D. J. Harvey is an associate professor of chemical engineering at Cleveland State Univ. where he teaches thermodynamics, mass transfer, process control and dynamic process simulation. He also works as a consultant for the Diamond Shamrock Corp., specializing in the area of process simulation. He earned his B.S., M.S., and Ph.D. degrees in chemical engineering at the Univ. of Michigan. He also earned an M.S. degree in mathematics at the same institution.

J. R. Fowler is a process engineer, Chemical Engineering Dept., Diamond Shamrock Corp., where he is primarily involved with reaction kinetics and process simulation. He earned his B.S.Ch.E. at the Univ. of Louisville and his M.S. and Ph.D. degrees from the Univ. of Toledo.

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CLE AIChE: Cleveland Chapter

Fall 2024 – Spring 2025 Program Planning

(as of Mar2025)

Month	Topic, Speaker	Location	AIChE Officer Responsible
September 7, 2024 (6 PM)	Oktoberfest Social Event	German Central Farm, Parma	Joe Yurko, $7/guest admission + $ food & beverage free for CSU AIChE students. https://germancentralfoundation.com/oktoberfest
September 11, 2024 (Wednesday 2:30 – 3:30 PM)	Dr. Yu, CSU, IEEE Quantum Computer	CSU, Engineering CSU AIChE & IEEE Students	Joe Yurko & Dr. Gatica, Dr. Holland, Members: $10; Students: Free CLE AIChE: Pizzas & Beverages
October 10, 2024 (Thurs. 6 PM)	M.W. Wilson Company Steam Safety Class & Tour	M.W. Wilson Company 2579 Center Road Hinckley, OH 44233	Joe Yurko, Jeff Wilson, Dinner provided by M.W. Wilson Co.? M.W. Wilson Co.: 330-225-0663 https://www.wmsilsoncoinc.com .
October 2024 (6 PM) Wed. 16Oct2024 Wed. 30Oct2024 Wed. 06Nov2024	Chemical Process Safety Analysis Seminars: by Gurmukh Bhatia, CPSA	Strongsville Fire Dept. Ward 1 Community Rm 11297 Webster Road, Strongsville, OH 44136	Joe Yurko, Dinner cost is included in the seminar expense. Seminar expense: $25 per session with a total of 3 sessions. Certificates will be awarded for each class as well as a final certificate. sfd: 440-580-3210:
November 13, 2024 Wednesday (4:00 – 6:00 PM)	Benjamin A. Horwitz "Portrait of a Chemical Engineer" Career Discussion with students and professionals	CSU AIChE Section Joint Meeting, Washkewicz College of Engineering AIChE Chap	Joe Yurko, Dinner menu ordering for professional members; Students cost: $5 http://places.singleplatform.com/shulas-steak-house-8/menu#menu_5599999 CLE AIChE: Pizzas & Beverages
December 17, 2024 (6 PM)	Nuclear Power Accident Analysis, Speaking: Andrew Ohrablo, Vistra Life Cycle Manag. Fleet Engineer	The Sanctuary, Rockside Road Independence, 44131	Joe Yurko, Dinner menu ordering for professional members; Students cost: $5 http://places.singleplatform.com/shulas-steak-house-8/menu#menu_5599999
January 28, 2025 (6 PM)	SARTA Hydrogen Fuel Cell Bus Fleet Expansion Funding from DOE ARCH2 Award, Kirt Conrad CEO	Burntwood Tavern Fairlawn, Akron Rt.18 and I-77	Joe Yurko, Dinner menu $26 ordering for professional members; Students cost: $5 Lobster Bisque Soup or House Salad Salmon Salad, or Angus Burger, or Fish & Chips
February 27, 2025 (6 PM): **Cancelled** March 13, 2025 (6 PM): **Rescheduled** March 26, 2025 at CSU (5:30-8 PM)	1976 Diamond Shamrock plant Fortran Simulation Startup Presentation Speakers: Dr. Fowler, Dr. Harvey Benjamin A. Horwitz, **Seminar** "The Good, The Bad, & The Ugly" Chemical Process Simulation	The Sanctuary, Rockside Road Independence, 44131 **CSU Student AIChE**, Seminar WH-405, Washkewicz Hall March 26, 2025; 5:30-8 PM	Joe Yurko, Dinner menu ordering for professional members; Students cost: $5 http://places.singleplatform.com/shulas-steak-house-8/menu#menu_5599999 Mike Galgoczy & Joe Yurko: Dinner: Pizza, professional members: $10; Students: Free. AIChE Students to bring their PCs for workshop with simulation case studies
April 4, 2025 at CWRU (12 noon – 2 PM) April 9, 2025 at CSU (2:30 – 3:30 PM)	Benjamin A. Horwitz, **Seminar** "The Good, The Bad, & The Ugly" Chemical Process Simulation Andrew Zak, Speaker: Academic Career Path with ChE PhD (CSU Alumni)	**CWRU Student AIChE**, Seminar AWS-349, AW Smith Building April 4, 2025, 12 noon-2 PM **CSU Student AIChE, Presentation** WH-405, Washkewicz Hall April 9, 2025; 2:30 – 3:30 PM	Mike Galgoczy & Joe Yurko: Dinner: Pizza, professional members: $10; Students: Free. AIChE Students to bring their PCs for workshop with simulation case studies
April 2025 (6 PM)	NEOSEF Awards Banquet	CCPL Branch Library Parma, Snow Road	Joe Spagnuolo, Moderator NEOSEF Students, CCPL Branch Library Dinner: Pizza, professional members: $10; Students: Free
May 20, 2025 Tuesday (3 PM)	Tour of Perry Nuclear Power Reactor Simulator and Plant	Perry Nuclear Power Plant & Simulator Tour 18 visitors	Ray Zucker, Joe Yurko and Mandy Nagle (Vistra, Communications)

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