A Tribute to Larry Evans

History of Aspen Technology
From the ASPEN Project to the Year 2000

by
Joseph Boston

AIChE Annual Meeting

November 18, 2014

Outline

- The ASPEN Project
- AspenTech Founding & Startup (1981-1986)
- Building the Business (1987-1990)
- Expanding the Business (1991-2000)

The ASPEN Project

- Funding
  - Over $6 million total
  - U.S. Dept. of Energy
  - 65 process industry companies (U.S., Europe, Asia)
- The Dual Mission
  - Develop efficient & consistent system to evaluate proposed synthetic fuel processes, both technically & economically
  - Develop a “next-generation” simulator to advance the state-of-the-art, with the capabilities to handle any process industry
- Main Location
  - MIT ChE Dept & Energy Lab

Original Bldg 20 at MIT

Bldg 20 Replacement
The Stata Center, designed by Frank Gehry

The ASPEN Project

- Staffing
  - 31 visiting engineers, project faculty, other professional staff
  - 7 post-docs
- Students
  - 81 undergrads
  - 54 graduate students

Key Technology Achievements

- Advanced system (data-driven PLEX architecture)
- Physical property system (methods, flexibility, database)
- Costing system
- Electrolytes
- Solids handling/solids properties
- Unit ops model library
- Coal conversion/synfuels models
- Convergence methods (advanced sequential modular)

The ASPEN Project

- Contributions to the Profession
  - 6 Doctoral theses
  - 23 Masters theses
  - 16 Undergrad theses
  - 27 Published papers
  - 36 Presentations at professional meetings

The Founders

- Seven key staff members of the ASPEN Project "bought in" to Larry's 1st business plan

Paul Gallier	Chau-Chyun Chen
Herb Britt	Andy Lui
Joe Boston	Fred Zeigler
	Howard Herzog

- All were full-time, Larry was on leave from MIT
- Larry was President, Paul, Herb & Joe were named VPs

AspenTech Founding & Startup (1981-1986)

Funding

- About $1 million was raised from:
  - Founding employees
  - Private individuals
  - State-financed VC group
- License was obtained to the ASPEN technology from MIT
- The grim statistics on new venture survival rates:
  - ~50% survive after 5 years
  - ~30% survive after 10 years

AspenTech Founding & Startup (1981-1986)

- The Vision
  - Provide state-of-the-art computer-based process engineering tools & technology needed by process engineers worldwide to design new processes & improve efficiency & productivity of existing plants
  - Provide support & other technical services to enable customers to best utilize the tools & technologies
- The First Office
  - 5000 sf at 251 Vassar St.
  - Part of a renovated warehouse leased from MIT

From the President

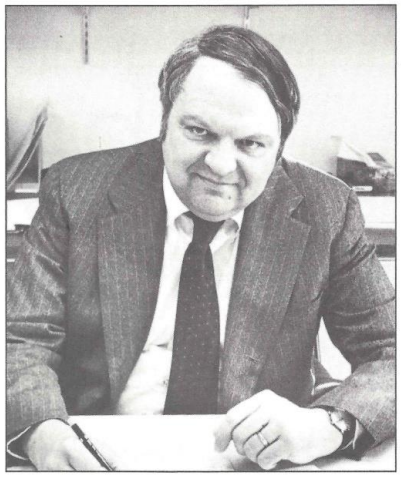
With this first issue of The Aspen Leaf we hope to open a new channel of communication among engineers who are interested in process flowsheet simulation. We intend to bring you news of the latest developments, not just by AspenTech, but also by our subscribers and by users of our products and services. Letters to the editor and articles are welcome and will be considered for publication at any time.

AspenTech is committed to staying at the forefront in the field of process modeling and simulation. ASPEN PLUS is our first product, but others are on the drawing boards to make certain our customers have the state-of-the-art tools they need for computer-aided process engineering.

I believe that the process industries are entering a new era where there will be even greater emphasis on better efficiency, improved productivity, and the development of new processes to make more specialized, value-added products. Computer-based flowsheet models provide the tool that process engineers must have to study these processes. AspenTech intends to provide not only the models, data bases, and software tools needed by process engineers, but also the services of our team of simulation specialists.

The field is dynamic and growing. Through the medium of The Aspen Leaf we hope to keep you informed with the news you need.

Larry Evans



AspenTech President Larry Evans

Dr. Lawrence B. Evans, AspenTech's president, founded the ASPEN Project in 1976 and served as Principal Investigator. He is presently on leave from his position as Professor of Chemical Engineering at MIT. Well known for his work in computer-aided process design and process control, Larry has served extensively as a consultant to industry. He was one of the founders of the CACHE (Computer Aids for Chemical Engineering education) Committee and is presently Director of the AIChE.

ASPEN Project Successfully Completed

(continued from page 1)

In October 1979 a working version of ASPEN was produced, and the testing phase

ASPEN has been used to model a variety of processes, including petroleum and petro-

The Aspen Leaf

Developments in
Flowsheet Simulation for
the Process Industries

Aspen Technology, Inc.
251 Vassar Street
Cambridge, Massachusetts 02139
Telephone 617-497-9010

ASPEN PLUS Enhancements Ready

The intensive ASPEN PLUS development program to add new process simulation capabilities and improve user friendliness and reliability is moving ahead on schedule. The first official ASPEN PLUS release was made in July; the first tape of major enhancements will be delivered in November; and a second set of key enhancements is now being prepared for delivery in early 1983.

Enhancements slated for release in November include new capabilities such as the assay data analysis/pseudocomponent system (see page 4 for more information), the unified property package, and the electrolyte capability, as well as more than 1,500 individual changes in the input language, computer code, and algorithms to enhance ASPEN PLUS reliability and ease of use.

(continued on page 3)

AspenTech's First Year
Subscribers Grow in Number and Diversity

The ASPEN PLUS family of subscribers is growing rapidly in both number and diversity. Just one year after AspenTech was formed--and in a time of economic recession--ASPEN PLUS has been adopted by some 20 leading companies in the process industries, companies with simulation needs in such varied areas as chemicals, petroleum, coal, engineering, pulp and paper, metals and minerals, and foods and biomaterials.

Recognizing that process simulation is an essential tool in the 1980s and that AspenTech offers the world's most powerful process simulator, AspenTech subscribers and clients are using ASPEN PLUS to advantage. Companies in France, Germany, Canada, Mexico, and throughout the United States are adopting ASPEN PLUS flowsheet models in process development to develop new products and processes; in process design to reduce costs and maximize productivity in new plants; and in existing plants to reduce costs and increase profits.

Chemical companies who have made the decision to subscribe to ASPEN PLUS include **Air Products and Chemicals, Chemical Company, the Eastman Kodak Company, the Olin Corporation, Tennessee Eastman**, and **Union Carbide and Chemicals. The General Electric Company** has also adopted ASPEN PLUS for its chemicals and plastics division.

Leading engineering design and construction companies are also subscribing to ASPEN PLUS in increasing numbers: **Combustion Engineering, the Lummus Company, Kohle und Mineralotechnik**, and the **Kellogg Company.**

ASPEN PLUS has been chosen to model synfuel processes by the **International Refining Company** and by the **Pittsburgh Energy Technology Center.**

AspenTech subscribers who have selected ASPEN PLUS to model petroleum and natural gas processes now include the **El Paso Products Company, Gulf Research and Development, Petro-Canada**, and **Standard Oil of Ohio.**

In the area of minerals processing, the **Reynolds Metals Company** is using ASPEN PLUS to model the Bayer Process for refining alumina. And ASPEN PLUS is also being adopted for use in food processing and biomaterials, with **CPC International** the first AspenTech subscriber in this field.


251
vassar
street

AspenTech Founding & Startup (1981-1986)

Key Milestones

- Full-time staff grew to 90
- Vassar St. office space tripled
- Established technical & sales relationships with China (1983)
- Focused initiatives in Europe
- Customer base grew to 85
  - 50 in North America
  - 28 in Europe
  - 9 in China
- Annual revenues increased to $4.5 million

AspenTech Founding & Startup (1981-1986)

Key Milestones

- Delivered 3 major releases of ASPEN PLUS, with major new features in all areas
- Notable new developments included:
  - 3 new distillation models
    (batch, multi-column & 3-phase)
  - Electrolyte process modeling capabilities
  - Biotechnology process modeling capabilities
  - First plant-wide optimization project, with major oil company

AspenTech Founding & Startup (1981-1986)

Key Milestones

- Established European support office in The Hague (1985)
- Launched annual User Group meetings
  - 1st in Oct. 1982 had 33 attendees
  - 5th in Oct. 1986 had 120 attendees
- Launched well-received university program (1985)
  - Provided all software to universities, at nominal fee, for teaching & research
  - As of 2003:
    - 680 participating universities worldwide
    - ~90,000 (cum.) ChE grads exposed to ASPEN PLUS software
- Obtained $2.6 million in venture capital (1986)

Building the Business (1987-1990)

Established the Business in Japan (1987)

- Why now in 1987?
- First customers
  - Sumitomo Chemical
  - Toyo Engineering Corp.
  - TOSOH Corp.
- Hiro Suzuki recruited as Director of Japan Operations
  - B.S. & M.S. in Applied Chemistry from U. Tokyo
  - M.S. in ChE from MIT
  - 18 years industrial experience in Japan
- Opened doors of ATJ in Tokyo in July
- Our business in Japan was launched!

Building the Business (1987-1990)

ASPENWORLD Triennial International Conference Series

- The purpose was to bring together an elite international group of people
  - Customer representatives
  - Academic scholars & industrial leaders in the field
  - AspenTech personnel
- ASPENWORLD 88, held in Amsterdam in 1988, the 1st of many
  - 200+ attendees
  - 65 speakers drawn from all 3 attendee groups
- ASPENWORLD 2000, the 5th, held over 3 days in Orlando
  - 2,000+ attendees
  - 300+ speakers
  - 70+ sessions

Building the Business (1987-1990)

Transformative Technology Developments

- First ASPEN PLUS (full system) on the 386 PC (1988)
  - Huge challenge given limitations of PC state-of-the-art in 1988
  - Greatly expanded access to ASPEN PLUS by users
- ModelManager for ASPEN PLUS (1988)
  - Graphical user interface/expert system for developing & using process models
  - Transformed the work process for users
  - For workstations as well as PCs

Other Key Milestones & Technology Developments

- Several major releases of ASPEN PLUS
- New capabilities in several areas
  - Distillation
  - Physical properties
  - Generalized polymer modeling
  - Generalized flowsheet optimization (based on SQP)
  - Pinch technology
- Full-time staff grew to 150
- Annual revenues increased to $12 million

Expanding the Business (1991-2000)

Aspentech's technologies characterized so far by "point solutions":

- Steady-state modeling & simulation
- Ever-wider range of processes
- Across many vertical industries

Over the next decade the company was "re-invented" 4 times

Expanding the Business (1991-2000)

Areas of Technology Opportunities for Expansion

- Dynamic simulation
- Real-time on-line optimization
- Plant information systems
- Advanced process control
- Supply chain management/optimization

Expanding the Business (1991-2000)

Dynamic Simulation

- Acquired Prosys Technology, Ltd (ProsysTech) in Cambridge, UK in 1991
- Brought on board:
  - SPEEDUP dynamic simulation system
  - Equation-based model development language
- SPEEDUP originally developed at Imperial College by Roger Sargent, John Perkins & Costas Pantiledes

Expanding the Business (1991-2000)

Dynamic Simulation

- SPEEDUP provided significant value to customers by enabling safer & more flexible plants, in terms of:
  - Startup & shutdown
  - External disturbances
  - Transients arising from, for example, feedstock changes
  - Plant control system analysis
  - Operator training

This was the 1st re-invention of the company

Expanding the Business (1991-2000)

Initial Public Offering of AspenTech Stock

In 1994 AspenTech became a public company with a very successful IPO on the NASDAQ exchange

Initial Public Offering of AspenTech Stock

Reasons for going public:

- Provide means for investors to realize return on investment
- Access to capital to invest in developing & acquiring technology & providing services
- Strengthen credibility with major customers
- Attract talented people by providing ownership opportunity
- Set higher standard of performance & public accountability

Plant Information Systems

- In 1995 Industrial Systems, Inc. (ISI) was acquired to support applications that act upon large volumes of detailed process data
  - Sometimes years of data for 10s of thousands of measurements
  - Provides repository of process knowledge
  - Essential for trouble-shooting problems

Plant Information Systems

- The ISI acquisition brought on board state-of-the-art systems for:
  - Acquiring, cataloging & storing the data
  - Accessing the data with graphical user interface
  - Interfacing to applications that depend upon the data

This was the 2nd re-invention of the company

Advanced Process Control

- In 1996 AspenTech simultaneously acquired DMC Corp. & SETPOINT, Inc.
  - Both recognized leaders in the field of advanced process control
  - Major head-to-head competitors of each other
  - Neither company was aware the other was being acquired

AspenTech Moves On-Line with Acquisitions of DMCC and Setpoint

AspenTech has completed two acquisitions that will enhance its ability to deliver a complete, integrated solution aimed at helping companies significantly improve their profitability through improved process simulation design and automation.

On January 5, AspenTech announced the acquisition of the Dynamic Matrix Control Corporation (DMCC) and the signing of a definitive agreement to acquire Setpoint, Inc. AspenTech has subsequently completed the acquisition of Setpoint.

"Our new company brings together a world class team of 950 people focused on enabling process industry companies to unlock the hidden value in their manufacturing processes by designing, operating and managing them safer and closer to the optimum," said Lawrence B. Evans, Chairman and Chief Execu-

our first choice as a partner because our companies have strong traditions of technical excellence; we have a lot of respect for both AspenTech and Setpoint. The ability to integrate process design and process automation applications is something we know that our customers want and will benefit from."

Charlie Cutler, founder of DMCC (l) and Doug White, President of Setpoint (r), with Larry Evans, Chairman and CEO of AspenTech.

Setpoint, formerly a subsidiary of Alcatel Alsthom (France), was founded

Expanding the Business (1991-2000)

- These acquisitions merged the key strengths of the 3 companies
  - Process modeling
  - Steady state & dynamic simulation
  - Real-time optimization
  - Advanced process control
  - Process information management
- Brought together:
  - Unparalleled team of people & process industry experience
  - Remarkable cross-fertilization of ideas & skill sets
- Number of employees more than doubled to ~1050

This was the 3rd re-invention of the company

Expanding the Business (1991-2000)

Supply Chain Management (SCM) & Optimization

- In 1998 AspenTech acquired Chesapeake Decision Sciences, Inc.
- Brought on board SCM & optimization technology & services
- The technology enables companies to better manage the supply chain to:
  - Reduce costs
  - Improve customer service
- Planning & scheduling capabilities include:

Strategic planning	Feedstock selection
Demand forecasting	Plant & unit scheduling
Capacity & resource planning	Distribution scheduling
Available-to-promise planning	

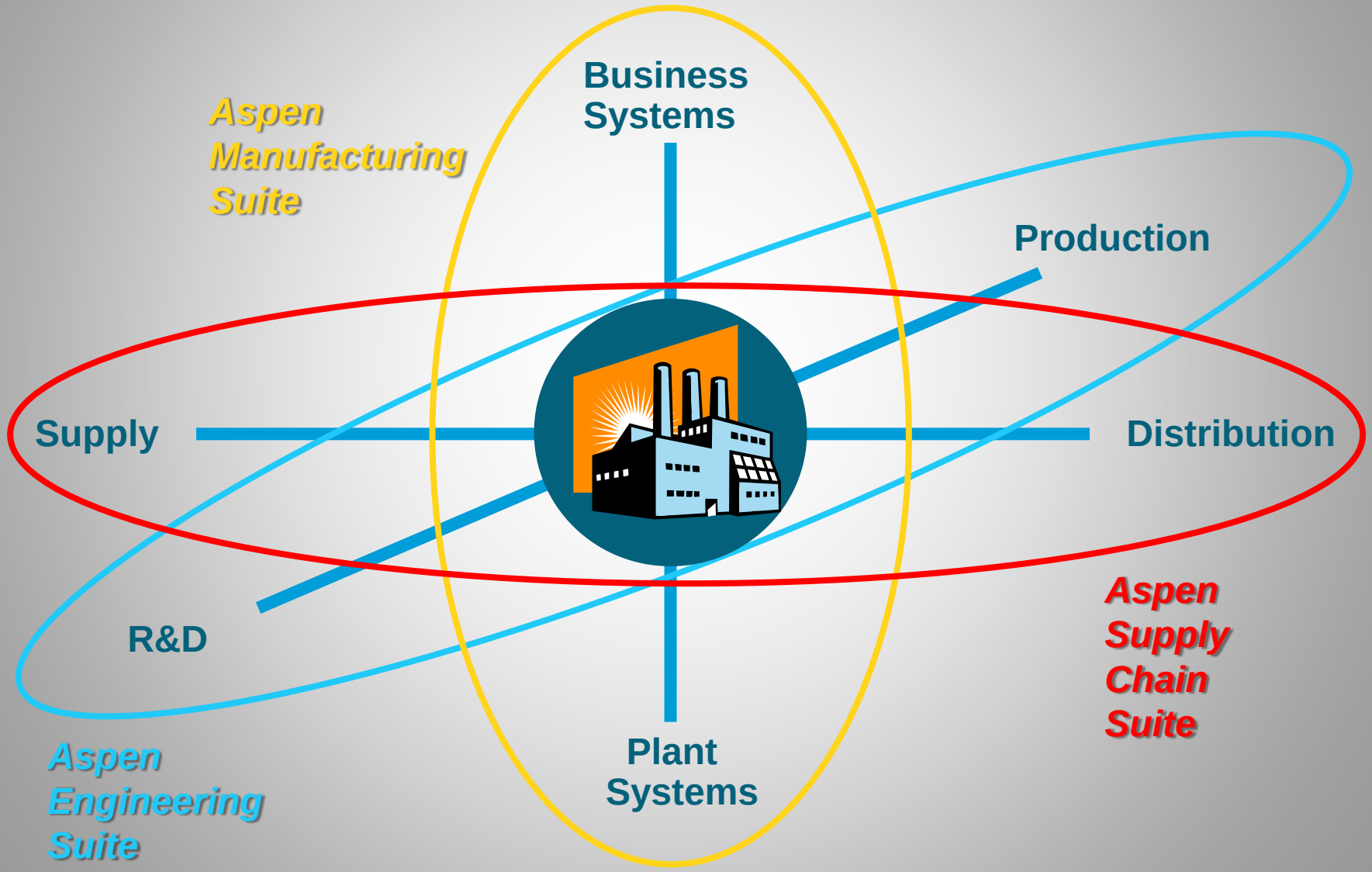
Expanding the Business (1991-2000)

Supply Chain Management (SCM) & Optimization

- Extended our capabilities beyond the single plant to the entire supply chain
  - From raw materials to distribution of products
  - To deal with logistics of mfg in multi-plant environments
- **This was the 4th re-invention of AspenTech**
- A new company strategy was introduced:

  “Optimizing the Enterprise”

The 3 Strategic Dimensions of Enterprise Optimization



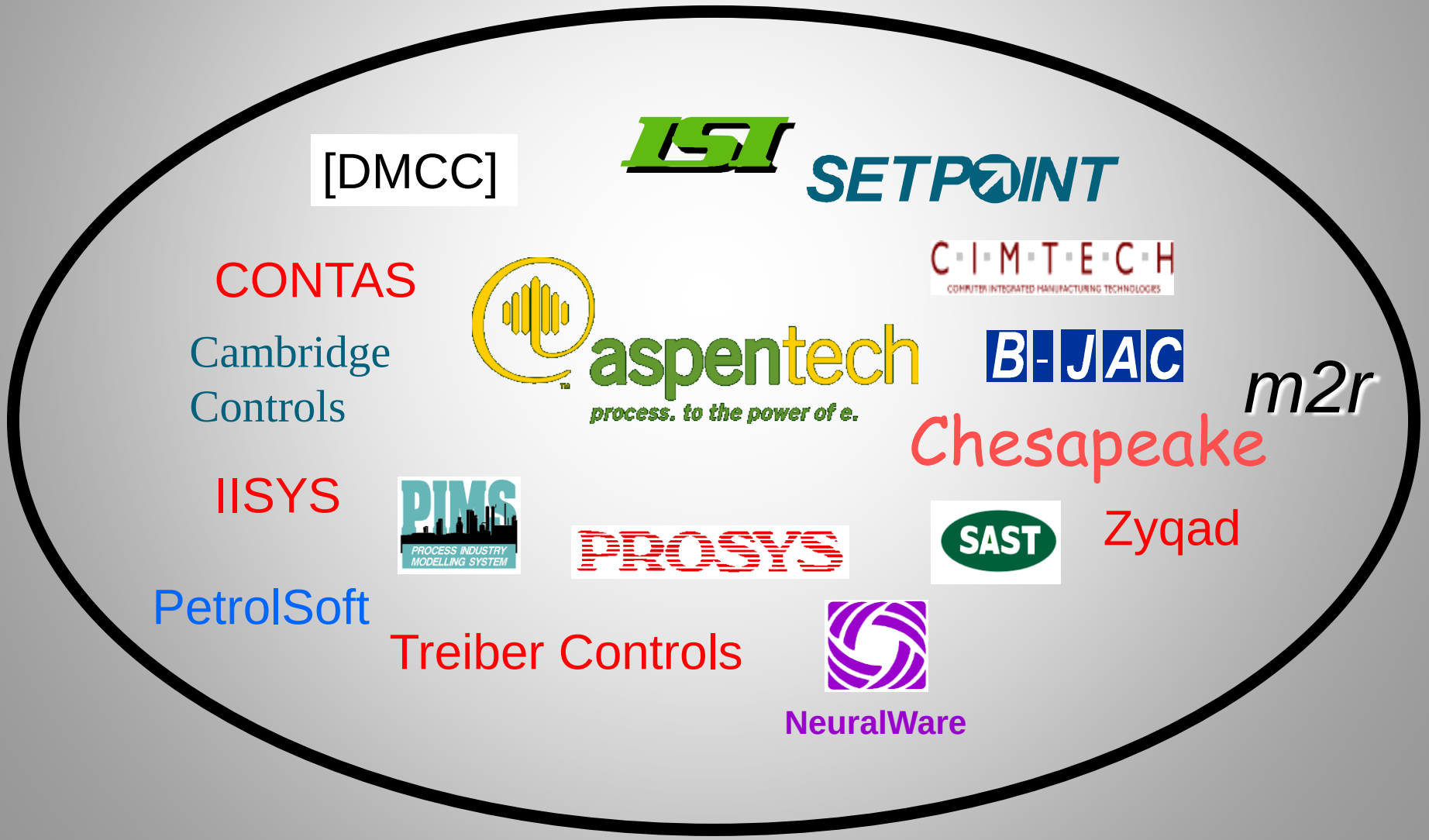
Expanding the Business (1991-2000)

The Aspen Framework - The Integration Infrastructure

Essential functions of the framework

- Serves as repository of plant models and shared data
- Internet-based architecture
  - Provides data access
  - Serves as local “traffic director”
- Provides role-based security
- Enables 3rd party applications to be integrated

17 Outstanding Companies Acquired from 1991-2000



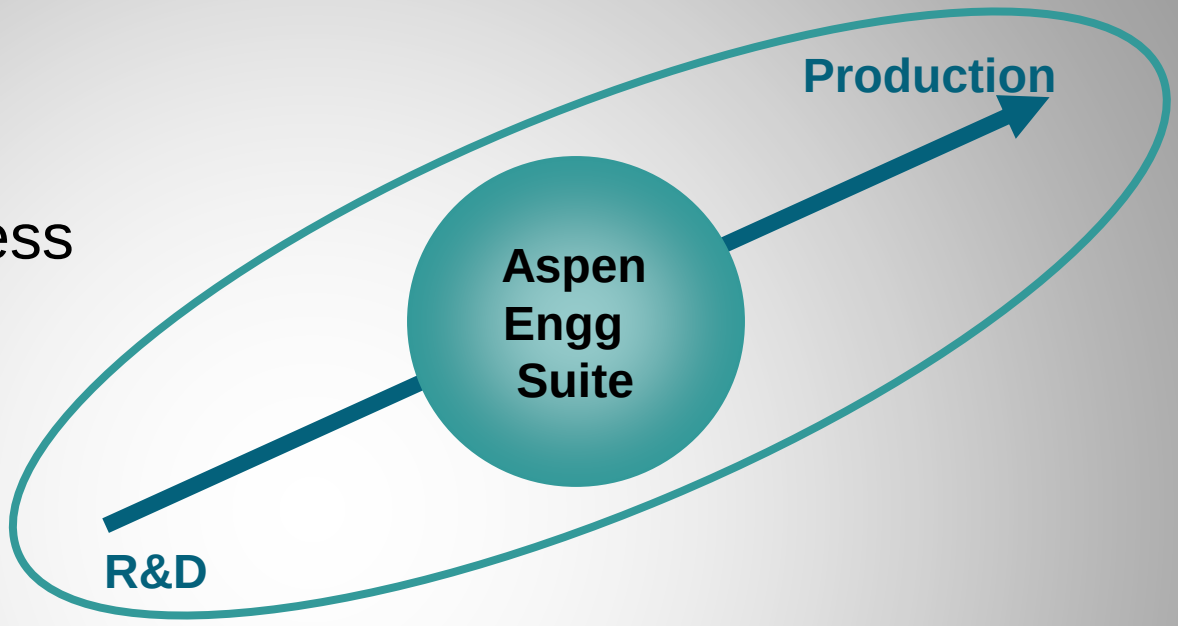
History of AspenTech
From The ASPEN Project to the Year 2000
A Tribute to Larry Evans

Closing Remarks

The Engineering Value Chain

Functions

- Conceptual process design
- Plant design
- Startup & commissioning
- Operator training
- Process improvement & optimization
- Troubleshooting & debottlenecking

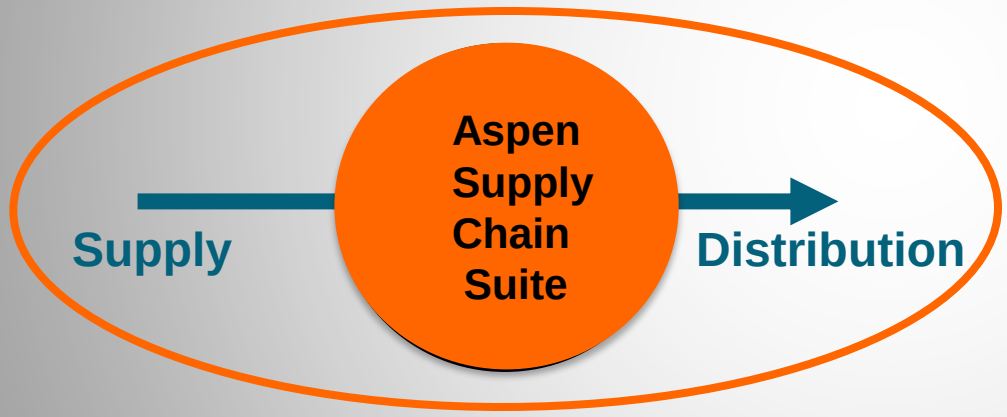


The Manufacturing Value Chain

Functions

- Process planning & scheduling
- Production accounting
- Process control & optimization
- Quality management
- Plant maintenance

The Supply Chain Value Chain



Functions

- Strategic planning

  (where & when to build, buy or sell)
- Sourcing of raw materials
- Distribution & logistics management
- Demand management

Acquisition Challenges

- Business strategy & vision synergies
- Organizational integration
- Technology/product integration
- Cultural integration
- The “message” to the outside world
  - Existing customers
  - Prospective customers
- These factors are largely worked out & agreed upon as part of the acquisition evaluation, but ….. ….. **It’s still not easy!!**

Cultural Factors

- Technical excellence of the people
- Dedication to excellence of products
- Work ethic
- Commitment to customer success
- Entrepreneurial spirit - & the sense of being part of something bid … & with bigger potential

Other Acquisitions

- PIMS
  - Powerful family of productivity tools based upon large-scale LP models
  - For economic planning & scheduling in the process industries
  - Acquired from Bechtel & Basil Joffe Associates

Other Acquisitions

- B-JAC International
  - Detailed HX modeling software
  - HX design & analysis at both thermal & mechanical levels
- Cambridge Control
  - UK-based consulting & systems integration company
  - Provided APC execution capabilities in Europe

Other Acquisitions

- Treiber Controls
  - Provider of APC & RTO technologies & services
  - Provided APC execution capabilities in Canada
- Zyqad
  - Provided software for integrating, automating & managing workflow among engineers designing new plants or improving existing facilities
  - From conceptual design to detailed engineering to plant operations

Other Acquisitions

- IISYS
  - Provided advanced software to collect, reconcile & report yield-accounting information
  - Enabled manufacturers to report production data accurately to their ERP & other business systems
- CIMTECH
  - Provided process information management systems driven by a distributed real-time & historical database

Other Acquisitions

- CONTAS
  - Based in Italy, expanded APC & advanced optimization capacity in Europe
  - Specialized in petroleum refining applications

Slide 1 - Title Slide

It is an honor and a pleasure to present this tribute to Larry Evans by telling you about the history of AspenTech.

Larry is known for many achievements during his long and distinguished career at MIT. But to many of us his signature achievement was his leadership in the founding of Aspen Technology as a commercial venture, and in the building of the company into a thriving business enterprise.

I personally had the pleasure of working with Larry for 25 years, from the early days of the ASPEN Project to the time I retired from AspenTech. I can say from my own experience that Larry's extraordinary vision and leadership guided, and provided inspiration for, all that was accomplished over those amazingly productive and exciting years.

Slide 2 - Outline

It all started with the ASPEN Project. Warren has already talked about the origin of the Project. I'm going to add just a few more points about the Project, then the rest of my talk is divided into 3 parts: the AT founding and startup period, the business-building period, and lastly the period in which the scope of the business was greatly expanded.

What I hope to do in this presentation is to convey – from an insider's vantage point -- a sense of the journey we traveled over that span of 2 decades.

Slide 3

I'll begin with a few points about the Project. Warren talked about the purpose of the Project, and why the DOE was interested in funding it. It was funded at a total level of about $6 million, roughly equally by DOE and a broad spectrum of 65 process industry companies. Given these dual funding sources, it was clear that, in essence, the project would have a dual mission, the 1st part to:

> develop an efficient and consistent system to evaluate proposed synthetic fuel processes, both technically and economically,

and the 2nd to:

> develop a "next-generation" simulator to advance the state-of-the-art, with the capabilities to handle any process industry.

These 2 parts of the mission were not only compatible with each other, but also in many ways they were dependent on each other.

At MIT the project was sponsored jointly by the ChE Dept. and the Energy Lab, and MIT was the main location of the work, though some work was also done at Penn under Warren's direction.

Slide 4

This is Bldg 20 at MIT where the project team was located. It was often referred to as the ugliest bldg on campus – this picture was taken in 1998, and it didn't look quite this bad during our time. But it had a remarkable history of housing innovative endeavors over many years before we occupied it – including the development of radar during WWII. Our small section of the bldg was renovated and outfitted very nicely for the project, making it rather "less spartan" than the rest of the bldg.

Slide 5

When Bldg 20 was demolished in 1998 it was replaced with this new bldg. Some would say it is still the ugliest bldg on campus! And someone suggested the crane may have been there just for reassurance. But I don't think that was the case.

Slide 6

These figures indicate the size of the project staff, including those who were based at Penn working with Warren Seider. The late Paul Gallier from Monsanto, Herb Britt from Union Carbide and I from U. Toledo were among the visiting engineers -- Paul as Project Manager, Herb and I as Associate Project Managers. Incidentally, Vladimir Mahalec was one of those 7 post-docs.

And there were a lot of students. As one might imagine, managing this large number of very bright and enthusiastic MIT students sometimes seemed like herding a bunch of cats! But the visiting staff and the post-docs were all very helpful in keeping them focused and productive – and productive they were.

Slide 7

This is a list of what we might consider to be key achievements of the Project. The ASPEN simulator was the first to be based on the very successful PLEX architecture described earlier by Warren. And it was the first in the public domain to have very comprehensive capabilities for physical properties, cost estimation, electrolytes and solids.

Slide 8

What did the Project contribute to the profession? An obvious way of gauging that is in terms of the software product itself, and all of the technology embodied in the product. But another way is just in terms of the numbers. In addition to a not-too-shabby number of theses there were a considerable number of published papers and presentations. These figures by the way include the work done at Penn.

Slide 9 – Part 2

Now let me turn to the founding and startup of AspenTech. As the ASPEN project drew to a close near the end of 1981, several of us on the project team began to think about forming a company to further develop the product and to commercialize an enhanced version of the product.

Being the supreme organizer that he is, Larry developed the 1st business plan, and presented that plan to members of the project staff who were interested. The late Paul Gallier, Herb Britt and I, along with 4 members of the staff who were recent MIT grads, bought into the plan, and the 7 of us decided to pursue the idea of a private venture with Larry of course leading the way.

Slide 10

The first step was to secure the funding called for in Larry's business plan. About $1 million was raised from a combination of the founders and a few other sources. For the founders this was quite a risk, none of us were "wealthy", and some of us actually had to take out loans at a time when the country was in a severe recession. And we were all well aware of these grim statistics on new venture survival rates. But we were all in, we were accustomed to working hard and taking on big challenges, and we had confidence in Larry's leadership. So we were off to the races!

Slide 11

The vision we had was to

> Provide state-of-the-art computer-based process engineering tools and technologies, needed by process engineers worldwide, to design new processes and to improve efficiency and productivity of existing plants,

and also to

> Provide the support and other technical services, to enable customers to best utilize the tools and technologies.

This was an ambitious vision for such a small group of people, but we had confidence, and we had a sense of “mission”.

Our first office was 5000 sf, just down the street from MIT. Once we had the office, with our name on the door, we had that feeling that most new ventures must have: “Now it’s real, we’re on our way, hang on for the ride!”

Slide 12

One of the first things we did was to launch an external newsletter called “The Aspen Leaf” that went to all our customers – and also to prospective customers. This is p.2 from Vol. 1, No.1, issued in the Spring of 1982, showing a young Larry Evans at his desk.

Slide 13

We were so happy we made it thru the 1st year, we had a celebration with this cake, shown on the 1st page in the Fall 1982 issue of the Aspen Leaf!

Slide 14

By that time we had already grown to a staff of 20, shown here in this picture in front of 251 Vassar, with the 8 founders in the front row, Larry in the center. We also already had 20 customers by that time.

Slide 15

The next 3 slides list some of the key milestones of this 5-year period. The office space was tripled to accommodate growth of the staff to 90 full-time people. We conducted major initiatives in both Europe and China. The China deals were initiated by Larry on a 1983 trip, which was quite an early time for anyone to be doing business in China.

By 1986 the customer base had grown to 85 worldwide. And it was already very diverse in terms of vertical industry coverage, as well as geographic coverage. Our annual revenues increased to $4.5 million.

Slide 16

On the product side, we delivered 3 major releases of ASPEN PLUS, with notable new developments that included significant advances in distillation, electrolytes, biotech process modeling and optimization. The optimization project was done with SQP, which in itself was a significant “first”.

Slide 17

On customer relations, we found – not surprisingly - that it was important to our European customers to provide local support. And so we established the 1st European office in The Hague.

We launched the practice of annual User Group meetings. And in later years there were multiple UG meetings that were held in all the geographic areas that we served.

We also launched the university program during this time, which provided all software to universities for teaching and research. Jila Mahalec led the program for 10 years, and I'm sure she would be disappointed if I didn't show you these impressive figures, which are an indication of the great success of that program.

And we obtained additional VC funding, which came at a very propitious time, when we had become dangerously short of working capital. And that's when we learned some important lessons about working capital.

Slide 18 – Part 3

This next 4-year period, from 87 to 90, was important in terms of building on the foundation we established during the 1st 5 years. We were armed with the infusion of new capital, and the torrid pace of development and growth of the company and the customer base continued pretty much unabated during these 4 years. In the interest of brevity I'm going to focus on just the most significant milestones.

One of the most significant things we did during this time was to establish the business in Japan. We had long been aware that there was an enormous chemical industry in Japan that was largely un-served by the technologies we offered. But we held off until 1987 because we knew it would take a major effort, and we weren't prepared to tackle it until this time. And also we were advised by marketing experts that you should not formally open, and announce, a business in Japan until you could also announce:

Two or 3 significant Japanese customers

Local leadership with outstanding credentials

Substantial local presence

We got the 1st 3 customers, and we recruited a great leader in Hiro Suzuki. With his impeccable credentials he was the perfect person for the job, and bringing Hiro on board was a big plus for us in this market. And so, we opened the doors of AspenTech Japan in July and our Japanese business was launched.

Slide 19

The 2nd important thing we did during these 4 years was to launch the tremendously successful AW conference series. The purpose of these conferences was to bring together an elite international group of people to present and discuss both business-related and technology-related developments, issues and needs of interest to all of us.

The 1st AW was held in Amsterdam in 1988. Over the next 12 years these conferences grew with each event in size, breadth and depth, culminating in the impressive numbers shown here for AW 2000, the 5th one in the series. A huge amount of effort always went into organizing and executing these events, but the feedback from participants showed that it was all worth the effort.

Slide 20

There were two, very significant, technology developments during this time that may be thought as having "transformative' or "game-changing" impacts.

The first was putting the full ASPEN PLUS system on the 386 PC. Starting in1982 there was this rapid evolution in PC technology that we all know about. For a long time we saw this evolution as "nipping at our heels", and tended not to take it seriously because we couldn't imagine putting a large SW system like ASPEN PLUS on one of these machines.

But then along came the 386 incarnation of the IBM PC, and suddenly we realized we had to embrace this phenomenon –- or else be consumed by it. And so we did embrace it. It was a huge challenge, given the still-existing HW limitations, but it was welcomed by users because it greatly expanded their access.

The 2nd game-changer was ModelManager. This was our patented GUI for developing and using ASPEN PLUS process models. The time was right for this, as the enabling computing technology, including the PC, had evolved to make it practical. It meant that ASPEN PLUS users no longer had to sort through sometimes complex input language, along with paper-based flowsheet descriptions, to develop a process model, or to run the model in case studies once it was developed. It enhanced dramatically the work processes for users.

Slide 21

There were many other important milestones and technology developments during this 4-year period, including major releases of ASPEN PLUS and new capabilities in the areas listed here. I won't take the time to elaborate on each one of these.

Also, during this time our full-time staff grew to 150, and annual revenues continued to grow at a hefty pace to $12million.

Slide 22 – Part 4

Shifting now to the expansion decade, one way to look back at AT's 1st 10 years is that – certainly – there were many significant technology advances. But it was still all about what we might call "point solutions", that is, steady state modeling and simulation of an ever-wider range of processes across many vertical industries. But we recognized that there was much more in our "universe" that could be developed or brought into the fold by acquisition, and in ways that would be very complementary and synergistic – both for our customers and for our own strategic direction.

Larry once said that we re-invented the company 4 times over this decade. In this last part of my talk, I'm going to focus on those re-inventions – what they were, how they came about, and what their impact was, in terms of changing the company in very profound ways. And also how they benefitted our customers.

Slide 23

These were the key areas in which we saw technology opportunities for expansion:

Dynamic simulation
Real-time on-line optimization
Plant information systems
Advanced process control
Supply chain management/optimization

The rest of this talk will be about how we approached each of these areas.

Slide 24

In the case of dynamic simulation, we had for some time been aware of ProsysTech and their very positive market presence with SPEEDUP. We decided that our most expedient path forward would be to acquire the company and bring the people into the fold along with the technology. We made the deal in 1991 bringing on board SPEEDUP along with its equation-based model development language.

SPEEDUP was originally developed at Imperial College by Roger Sargent and his colleagues, and so it was necessary to get their blessing to make the deal – which they graciously did grant – allowing us to go ahead with the deal.

Slide 25

This acquisition turned out to be a very successful one. It brought a lot of new value to our customers because it enabled them to design and operate safer and more flexible plants in terms of the factors listed here:

Startup and shutdown
Disturbances
Transients
Control system analysis
Operator training

This was the 1st re-invention of the company as we were then able to provide a full suite of software for modeling and simulation on the engineer's desktop.

Slide 26

After this 1st acquisition, we took a major leap that would serve the company from that time forward. Since the beginning of the decade we had known that the company would eventually have to go public in order to have access to the capital needed to fully pursue our vision. 1994 seemed like the right time to go for it, and so we did.

Slide 27

This was a very big deal for the company for all the reasons listed here:

It provided a means for investors to realize a return

It gave us access to capital that we would need going forward

It strengthened our credibility with customers

It helped us attract talented people

It set higher performance standards for the company to meet.

Slide 28

Not much time passed after the IPO before we were ready to take the next step into the on-line world by acquiring ISI, a company that was known for its information systems expertise and products. These are systems that manage extremely large volumes of plant data and make the data available for other on-line applications – and for off-line analysis applications too.

Slide 29

This brought into the fold systems for acquiring, cataloging, storing, accessing and interfacing the data. And these systems became important pieces of what we needed to implement our strategy. This was the 2nd re-invention of the company.

Slide 30

The next step we took was the virtually simultaneous acquisition of DMCC and SETPOINT, the two recognized leaders in the field of advanced process control. There is an interesting tidbit about these simultaneous acquisitions that may not be widely known. It was of course well-known that the two companies were head-to-head competitors of each other. But the tidbit is that neither company was aware that the other was being acquired! And this made for some "interesting" early moments.

Slide 31

This is a picture that was taken a short time later with Larry, Charlie Cutler (founder of DMCC), and Doug White (Pres. of SETPOINT) – and everyone was smiling, so it's fair to say it all worked out.

Slide 32

This was a really important step because it merged the strengths of all 3 of the companies in these 5 areas listed here that were critical to our strategy. It also brought together an unparalleled team of people and experience that resulted in a lot of valuable cross-fertilization. And this was by far our biggest step in terms of sheer size – more than doubling the no. of employees, seemingly overnight, and presenting some "challenges" in the days and weeks that followed.

It was the 3rd re-invention of the company.

Slide 33

The final key piece of the puzzle, supply chain management and optimization, was largely outside our main areas of expertise. So this called for another acquisition and in 1998 we acquired Chesapeake Decision Sciences, a company that had developed enormous expertise, outstanding technology, and a very strong market presence.

This technology enables companies to better manage the supply chain to reduce costs and improve their own customer service. The acquisition brought on board a full panoply of planning and scheduling capabilities including those you see listed here.

Slide 34

This acquisition extended our capabilities beyond the single manufacturing plant to encompass the entire supply chain, from raw materials procurement to distribution of products, to deal with the logistics of manufacturing in a multi-plant environment. With this 4th re-invention of the company we could then position ourselves as a provider of all the tools, technologies and services needed to truly optimize the enterprise, from the plant floor to the supply chain, encompassing multiple plants.

It was truly a new paradigm for the company – we called it "optimizing the enterprise". During the last 2-3 years up to the end of 2000 we went thru several generations of thought about how best to envision this new paradigm and how best to present it. With the last couple of slides, I'm going to show you a sort of "bare-bones" view of what was the latest generation at that time.

Slide 35

We can think about the enterprise in terms of 3 strategic dimensions. Each of these dimensions represents a fundamental value chain for process manufacturers. In order to enable our customers to comprehend, and relate to, the wide range of technologies and products we were then able to offer, we packaged them in suites that aligned with these 3 value chains: for R&D to Production it was the Engineering Suite, for Plant Systems to Business Systems the Manufacturing Suite, and for Supply to Distribution the Supply Chain Suite.

Slide 36

Finally, there is the integration infrastructure – we called it the Aspen Framework – that enables all the technologies to work together in an integrated environment. The essential functions of the Framework included: serving as a repository of models and data, providing access to the data, serving as the traffic director, providing role-based security and managing the integration of 3rd party applications. The net effect of this framework was to dramatically reduce the implementation times for solutions.

Slide 37

These acquisitions that I've talked about are the 5 key ones, out of a total of 17, that were made over this decade. I won't take the time to mention the other 12 individually, but this last slide shows all 17. With a few exceptions the other 12 were relatively small, adding pieces of technology, products and expertise that fit in with our new strategy.

Undoubtedly it had the look of chaos from the outside, and the way of envisioning it all that I've just described – including many details I didn't have time to show you -- helped customers and others to see the "method in the madness" and to understand how the new strategy would benefit them.

Slide 38 Closing Remarks

Now in closing let me say thank you for letting me share with you this brief history of the AT journey. The success of that journey was to some extent a function of the right kinds of things coming together at a certain time and place, and with a certain group of many excellent people.

But we have always benefitted from, and have been grateful for, Larry's vision and leadership over the years, and for the opportunity to work on the ASPEN project, and to build a successful business as an outgrowth of that project. We like to think that what we did toward the end of the 20th century, laid a good foundation for what was to come in the 21st century. And I think that has been the case by at least one measure: the AT market value of $3.9B as of the end of 2013.

So Larry, congratulations on making it to 80, best wishes for many more, and thanks for leading us thru all these productive, exciting, terrific years!