About Eastman: 
An Engineer’s View of History 

Tim Nolen, Engineering Leader and Fellow 
July 2012
Eastman History Resources

- Eastman History Exhibit – B-310
- Utilities History Exhibit – B-469
- Eastman History Videos (3 on streaming media)
- Eastman Timeline (online)
- Eastman History Book: “Years of Glory. Times of Change” (1990s vintage)
Kingsport had a vision to become an industrial town.
Kodak Needed Materials

- World War I interrupted commerce and George Eastman was determined to secure his supply.
- Kingsport had a wood distillation plant, a willing spirit, and a new railroad.
Kodak needed and we delivered

- Methanol
- Cellulose acetate (safety film)
- Hydroquinone
- PET
- Photographic chemicals
Eastman Chemical’s True Founding Father: Perley Wilcox

Perley S. Wilcox (1874–1953) was referred to as the “father” of Tennessee Eastman Corporation or, more commonly, as “Uncle Perley” by many people in Kingsport. Wilcox was elected a director and appointed general manager of the newly formed TEC in 1920. Joining Eastman Kodak Company in 1898, Wilcox served in various executive positions over the years. In 1945, he became chairman of the Kodak board. As James C. White said, “... it was only because of the great ability, the hard work, and especially the great determination of Perley S. Wilcox that we weathered the very substantial monetary losses that were experienced during our first 15 years of operation. It is a historical fact that except for Mr. Wilcox and the support he received from Frank W. Lovejoy at Rochester there would be no Eastman operation in Kingsport today.”
Wood Distillation provided methanol and acetic acid. Building 3 and plant in 1929.
Building 1: Administration

Top of Bays Mountain: Logged for the trees
Sawmill devours ever more

Band sawmill operated between 1927 and 1945

White farmhouse is today research pilot plant area

Log Pond fed by “Hales Branch” which today is submerged near Konnarock and Lincoln street and runs under corner of B-150C to NW corner of B-162

Sawmill location occupied today by tow warehouse between B-150 and B-162
Adaptation: Cellulose acetate for textile fibers, not just safety film

Yarn plant, B-70, 1932. It’s still in operation today!

Henry Ford: Any color you want, as long as it’s black.

Today, you can get a Chik-fil-a.
1933 Kingsport Phone Book

Taylor S Z r 142 Wanola ........................................... 968
Templeton S D Grocery Store
1026 Maple .......................................................... 414

TENNESSEE EASTMAN CORPORATION:
Business hours—8:00 a.m. to 5:30 p.m.
Call ................................................................. 5101
Holidays and after 5:30 p.m. to 8:00 a.m.
General Office Building 1 ................................ 5101-1
Turbine Room Building 6 ................................ 5101-2
Band Sawmill ....................................................... 5101-3
Laboratory Building 51 ......................................... 5101-4
Gate House Cellulose Acetate Plant
Building 52 ......................................................... 5101-51
Gate House Wood Distillation Plant
Building 18 ........................................................ 5101-52
Building No 10 .................................................... 5101-56
Laboratory Building 57 .......................................... 5101-7
Stair Tower Building 58 ......................................... 5101-81
Gate House Acetate Yarn Plant
Building 60 ........................................................ 5101-82
Machine Shop ....................................................... 5101-9
Main Power House Building 53 ............................. 5101-10

Bays Mtn Fire Stations:
Blair’s Gap Store ................................................. 3302
Braggs ................................................................. 3303
Depew ................................................................. 3304
Haynes J F r Van Hill .......................................... 3305
Morrison Burton .................................................. 3306

Tenn Motor Co Ford Agency Sullivan ................. 63
Tenn Motor Co Used Car Dept Center ............... 724

1939 – Before the War

- Hale’s Branch
- Eastman Road
- Baseball Field
- Edgewood Village
- Retorts and distillation building
- Yarn plant
- saw mill and wood yard
Wood distillation provided only 1 lb of methanol / acetic per 6 lb of wood.
Eastman’s new products in the 30’s and 40’s

- Acetic acid cracking
- Ethanol to acetic acid
- Butanol to butyric acid
- Tenite plastics
- Acetate Staple Fiber
- Acetate dyes
- Triethyl phosphate
- Isopropyl Acetate
- HQ and derivatives

Eastman’s first profit was not realized until 1932.
Donald Othmer invented acid concentration process

- Ph.D. in chemical engineering from U. of Nebraska in 1925.
- Worked for Kodak in Rochester from 1927 to 1931.
- Was professor at Brooklyn Polytechnic starting in 1932 (150 patents / 350 publications).
- Invested with Warren Buffett (also from Omaha) in the 1950s.
- Died in 1995 with an estate worth $750 million.
- He and his second wife Mildred had no children, and gave estate to many charitable organizations.
Worked for Kodak from 1927-1931. Invented Eastman’s Acid Concentration Process which enabled entire acetyl stream.
Long Island Flood of 1940

Ft. Patrick Henry Dam completed on October 27, 1953.
Tennessee Eastman Company Wins the War

• Implemented U. Michigan process to make RDX, high explosive
• Created Wexler Bend Pilot Plant to make RDX within 26 days of being asked by the government
• Was contractor for atomic bomb Manhattan Project at Oak Ridge
• Eastman employed 30,000 people at Oak Ridge and Holston Ordinance Works at height of effort(!)
Produced first RDX in 26 days

This photo contributed by the U.S. Army shows the original Wexler Bend Pilot Plant, which manufactured RDX for the Allied effort before the Horse Creek Pilot Plant and Holston Ordnance Works were constructed. The photo below, by Sharon Caskey Hayes, shows the plaque that marks the site of the Wexler Bend Pilot Plant, next to Eastman just below John B. Dennis Highway, along the Holston River.
1948 – Yes, the world was in color
1955 – Golden Age of Manufacturing in America
Most elements of the Research Complex were established 1948-1952.

Picture: March 1955
1958
We’d like the river over there, please.
Growing Pains

April 4, 1953

— Explosion in B-159 in research — Four employees killed

Explosion greatest tragedy in city history

Continued from page 1C

Bannered across the top of the front page of Saturday, April 4, 1953’s Kingsport News was:

“EASTMAN BLAST KILLS WORKER

“Five Injured During Mishap

“One man was fatally injured in an explosion shortly after 4 p.m. Friday in the Research Laboratory area of Tennessee Eastman Company, a second employee suffered injuries to both legs and burns. Four other men received first- and second-degree burns. Fatally injured in the accident was William Ray Bowman, 36, Route 4, Jonesboro. He was a pilot plant operator.”

“But as the days passed, three other employees succumbed to their injuries: Robert O. Feathers, Carl R. Monroe and William F. Prine.

“The newspaper reported, “The accident was caused by explosion of a chemical container. ... Damage to equipment was confined to one room in Building 159.”

“Seven years later, in 1960, Building 207, the Aniline Building exploded.

“Six months after that, Eastman formed a Reactive Chemicals Committee to study and promote safety issues. That committee has been through several names and branched into numerous subcommittees, but it still meets and its purpose remains the same: to make sure that a similar tragedy never happens again.

“Forty-nine years later, Eastman explosions are a thing of the past, the distant past.

“Contact Vince Staten at vincestaten@timesnews.net or via mail in care of this newspaper. Voicemail may be left at 723-1483. His blog can be found at vincestaten.blogspot.com.

Growing Pains

October 4, 1960

• Explosion in Aniline plant, B-207, 16 employees killed
B-207 Aniline plant exploded Oct. 4, 1960 killing 16
Blast Toll 13

Eleven Identified; Two Lost, Presumed Dead

Oct. 5, 1960 – Displayed in B-469
Research Building 150, 150A in 1965
Adaptation / Innovation in Acetyls
Acetyls Adaptation / Innovation
Before 1950

Credit: Joe Zoeller
Acetyls Adaptation / Innovation
Before 1950

Credit: Joe Zoeller
Acetyls Adaptation / Innovation
1970

H₂C=CH₂ → AcH → AcOH

Butane

MeOH

O₂

CO

ethylene

Vinyl Acetate

H₂C=CH₂ → Ac₂O → Cellulose Acetate

O₂

- H₂O (ketene)

+ AcH (-AcOH)

Eastman
1950s-1991

Credit: Joe Zoeller
Acetyls Adaptation / Innovation

Today

Eastman Today
Coal Gas Phase II
1991 eliminated need to use acetaldehyde to make acetic acid

Credit: Joe Zoeller
Adapting Acetyls

- 1930 – cellulose acetate for safety film
- 1931 – cellulose acetate for textiles
- 1932 – cellulose acetate for plastics
- 1938 – cellulose acetate butyrate
- 1952 – filter tow for cigarette filters
- On and on to other applications in coatings and films
1983 – Coal Gas (Phase I) Starts Up
Adaptation / Innovation in Polyester
The Dawn of Polyester

- Polyethylene Terephthalate was developed at ICI in the 1930s.
- DuPont and Eastman produced it during WWII as a nylon substitute to meet war demand.
- After the war, DuPont licensed PET to Eastman for use as film base.
- Eastman licensed PET bottle patents from DuPont and made its first PET for bottles in 1979.
- Eastman ended production of PET fibers for textiles in 1993.
- Eastman sold the PET business in 2011.
Polyester Adaptation / Innovation

• Got into fibers for war production (1940s)
• Adapted PET as film base for Kodak (1950s)
• Developed TPA / DMT processes (1950s)
• Built two EG plants at Texas in the 1960s to integrate
• Changed TPA chemistry in the early 1980s to avoid acetylacehydro-to-acetic acid co-production
• Adopted direct esterification of TPA (PTA)
• Created Integrex™ technology for esterification (2000s)
• Built iso-phthalic acid plant in the late 1990s
• Created co-polyesters to build specialty plastics business
Credit: Eric Moskala
What have we done lately at Tennessee Operations?
What have we built lately in Kingsport?

- 1983 – New hydroquinone plant with improved chemistry
- 1991 – Coal gas phase II for more acetic anhydride
- 1992 – Primester JV for cellulose acetate flake
- 1998 – Isophthalic acid plant
- 1998 – New World Headquarters B-280B,C
- 1998 – Research expansion, B-150C
- 1990s – CHDA plant (1990s)
- 1990s – Liquid Phase Methanol Plant
- 2011 – TMCD for Tritan™
- 2012 – Perennial Wood Demonstration Plant
- 2012 – New Cellulose Triacetate Plant
- Plus lots of expansions and infrastructure projects
Increase in building numbers in time is a straight line

![Graph showing a straight line relationship between building numbers and year completed, with R² = 0.9878 and various building numbers labeled with their respective years and purposes.]
Eastman Kingsport, TN
“An integrated site”

- 5 Manufacturing Divisions
- Hundreds of chemicals, fibers, and plastics produced
- ~7,000 Eastman Employees
- >1,000 Contract Employees
- >500 buildings and ~4,000 acres of land
  (main plant occupies ~900 acres)
- ~90% power & 100% steam internally produced
- ~165MW avg. electrical use

**Energy Input**
- Power & Steam Production
- Major Steam Distribution
- Major Furnaces or Stacks

**Representative OUTPUT**
- Chemical Production Plants
- Fibers Production Plants
- Plastics Production Plants

<table>
<thead>
<tr>
<th>Hundreds of Commercial Products</th>
<th>&gt;650</th>
</tr>
</thead>
<tbody>
<tr>
<td>Billions of lbs of Sales Volume</td>
<td>~4,700</td>
</tr>
</tbody>
</table>

Credit: Ron Sheppard
A Few Words About
Texas Operations (TXO)
(a.k.a. Texas Eastman)
After WWII, TEC wanted to integrate back to raw materials

• Longview, Texas was selected because of
  – East Texas Oil Field
  – Sabine River
  – Two Railroads
  – Strong Labor Force

• Plant site is 6,000 acres!

• Artificial lake with thermal dam provides cooling water
EASTMAN LOCATES HERE

The Longview Daily

News

Combined Edition

MARSHALL

Combined Edition

NEWS MESSENGER

Combined Edition

Vol. 73, No. 67

Marshall, Texas, Thursday Afternoon, August 25, 1949

12 pages

GREGG-HARRISON COUNTIES SELECTED FOR BIG PLANT

This is Parent Plant of Tennessee Eastman Corporation at Kingsport

WESTERN UNION

TENNESSEE EASTMAN CORPORATION IS HAPPY TO ANNOUNCE THE SELECTION OF A SITE IN GREGG AND HARRISON COUNTIES NEAR THE CITY OF LONGVIEW FOR THE HOME OF ITS NEW PLANT. WE THANK YOU FOR YOUR EFFORTS AND COOPERATION WHICH HAVE BEEN HELPFUL TO US IN REACHING THIS DECISION. WE TRUST THAT THE RELATIONS BETWEEN OUR COMPANY AND THE CITIZENS OF YOUR COMMUNITY WILL ALWAYS BE PLEASANT AND MUTUALLY ADVANTAGEOUS.

JAMES C. WHITE, PRESIDENT

Plant Site North of Sabine River

KINGSPORT, Tennessee, Aug. 25.—Tennessee Eastman Corporation announced today that a site has been selected to Gregg and Harrison Counties near Longview, Texas, for the erection of a plant to manufacture certain basic raw materials for use in operations at Kingsport, Tennessee.

Deeds are being taken covering a large tract of land along the Sabine River near Longview, bringing...
Texas Eastman Groundbreaking March 23, 1950
Texas Eastman 1952
250 Employees
Texas Operations - Today

~1,600 Employees
> 40 Chemicals and Plastics
~ 4 Billion Pounds/year

- Olefins
- Polyolefins
- Alcohols
- Aldehydes
- Solvents
- Resins
- Other Chemicals
Longview, Texas

6000 acres
First production 1953

1600 employees
40 products
4 Billion lb/yr

- Olefins
- Polyolefins
- Alcohols
  - Aldehydes
  - Solvents
  - Resins
  - Other Chemicals

CONFIDENTIAL
Beyond Kodak:

Eastman Chemical grows up and leaves home Jan. 1, 1994
Triumph! Eastman spins free of Kodak on Jan. 1, 1994!

- Kodak facing tough future—returning to core
- Eastman Chemical fortunate to get independence with headquarters in Kingsport
- We also got billions in debt, but profits boomed in 1995 and we survived.
- We won the Malcolm Baldridge National Quality Award in 1993—but we survived anyway!
Life Before and After Kodak

Before the spin
• US chemical industry grows faster than GDP
• Focus is on organic growth – building plants
• Kodak business necessity establishes core
• Kodak strength helps ECD weather cycles
• Kodak provides corporate identity and functions

After the spin
• US chemical industry matures
• Acquisitions, divestitures more prominent
• Eastman must define its own core
• Eastman must deal with stockholders
• Eastman must establish new identity and corporate functions
ECD Homegrown Plant Sites Peaked in 1981

In 1981:
• TEC (Kingsport), est. 1920 – 12,500 employees
• TEX (Longview), est. 1950 – 2600 employees
• CEC (Columbia, SC), est. 1967 – 2000 employees
• ARK (Batesville, AR), est. 1977 – 600 employees
Life on our own is tough in a maturing and globally competitive industry.
Productivity has marched ever upward

**Eastman Sales Revenue per Employee**
(constant 2012$)

- 1938: $0.083
- 1938-1985: 2.5%/yr
- 1985-2012: 3.7%/yr
Why don’t we like commodities?

• Legacy of Kodak – Technology and market differentiation provide higher, more stable profits

• Commodities require stripped down, low cost organization

• The two models don’t mix well in the same company
The Winning Formula – What is working

• Expanding the core
  – Build on strengths
  – Chemistry
  – Chemical engineering
  – Operational excellence

• Acquiring More!
  – Add compatible businesses
  – Differentiated technology and products
The Winning Formula – What is working

• Expanding the core
  – Fibers growth in Asia (production and sales there)
  – Plasticizers – World leader enhanced by acquisitions (Genovique, Sterling Chemicals, internal growth)
  – Specialty Plastics – Building on co-polyesters with new monomer
  – Expanding Oxo chemicals for rising demand with advantaged Longview position
  – Expanding cellulose esters for new applications at high margins
  – Acetylated Wood

• Acquiring More!
  – Solutia – major increase in industry position, complementary but expanded portfolio, high margins
  – Small Technology acquisitions to aid growth projects
Solutia will help maintain Eastman’s Prominence in the US Economy
Eastman – 92 Years Old, Strong Profitable Core, and Financial Resources for Balanced Growth

• 18 years as independent Fortune 500 public company headquartered in Kingsport.
• Continuing to invest in existing plant sites and in newly acquired ones
• Solutia acquisition helps us to stay independent and integrated