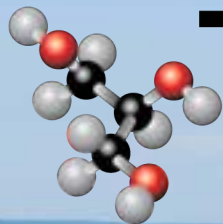


# ***FUTUREFUEL***<sup>®</sup>

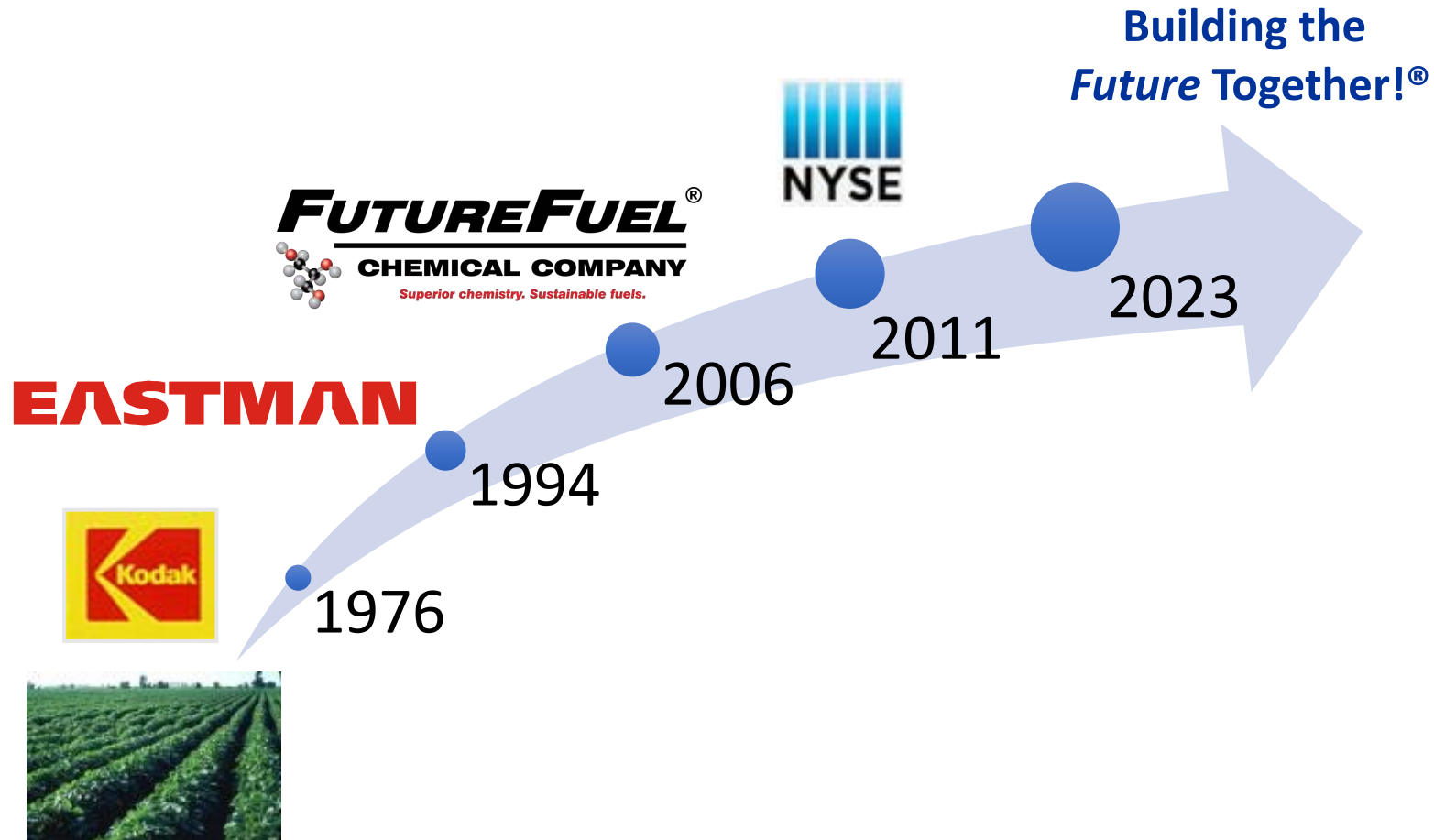


## **CHEMICAL COMPANY**

***Superior chemistry. Sustainable fuels.***



# Our Site History





# Company Overview



## Business Segments

- **Biofuels**
  - Biodiesel
  - Refined Glycerin
- **Chemicals**
  - Performance
  - Custom

# Performance Chemicals

- Primarily sulfonated monomers, specialty solvents and polymer additives
- Active R&D new product development:
  - FutureChem® Duality
    - 'Dual action' bleach activator & chelant for HI&I detergents
  - FutureChem® Bio-Betaine
    - Surfactant with higher bio content and improved performance vs. CAPB
- New monomer additives for nylon & polyester fiber processing
  - Improved dyeability and stain resistance
  - Eliminates process downtime associated with current chemistry



# Custom Chemicals

- 47 years of reliable custom contract manufacturing
- A world-class, fully integrated and full-service site.
- All the capabilities of a multinational, but with more flexibility, responsiveness, and commitment to excellence.
- Our Expertise: complex organic chemistries, synthesis and process development, engineering, commercialization, and customer service.



# Technology Capabilities

## Our professionals:

- 5 PhD Organic Synthesis Scientists
- 8 Bench Chemists & 2 Technologists
- 1 PhD Chemical HSES Engineer
- 2 PhD Analytical Scientists
- 1 BS Chemist, 4 Technologists
- 4 Instrument Specialists
- 13 Shift Analysts

## Plus:

- 2 PhD Analytical Scientists (Production)
- 1 PhD Application Scientist

## Services include:

- Synthesis development
- Method development, validation
- Product and process safety testing
- Complex analytical testing
- Process optimization



# Synthesis Expertise

Acetoacetylation

**Acetylation**

Acid Chlorides

Acylation

Alcoholysis

Aldol Condensation

Alkoxylation

Alkylation

Alkylation, Reductive

Aminoalkylation

Asymmetric Synthesis

Benzoylation

**Benzylation**

**Bromination**

Benzylation

Carbonylation

Catalytic Reduction

Chemical Reduction

**Chlorination**

Chlorosulfonation

Cyanation

Cyclization

**Decarboxylation**

Dehalogenation

Dehydrogenation

Diazotization

Epoxidation

**Esterification**

Etherification

**Formylation**

**Halogen Replacement**

Halogenation

Heterocyclic Chemistry

Hydrobromination

Hydroformylation

**Hydrolysis**

Hydroxylation

Methylation

N-Alkylation

Nitrosation

**Nucleophilic Substitution**

O-Alkylation

Organometallic Reactions

Oxidation

Phase Transfer Reactions

**Polymerization**

Quaternization

**Ring Closure**

**Saponification**

**Sulfonation**

**Transesterification**



# Analytical Capabilities

Development and production samples are, almost exclusively, analyzed on-site using our very wide array of analytical instrumentation

- Nuclear Magnetic Resonance (400mHz)
- Ion Chromatography
- Liquid Chromatography
- LC/Mass Spectroscopy
- Gas Chromatography
- GC/Mass Spectroscopy
- Differential Scanning Calorimetry (DSC)
- UVF Sulfur Analyzer
- UV/Vis Spectrometers
- Fourier Transform Infrared
- Inductively Coupled Plasma (ICP)
- X-Ray Fluorescence
- Thermal Gravimetric Analysis
- Total Organic Carbon (TOC)
- Particle Size Analyzers
- KF & Auto Titrators



# Process Hazard Evaluation & Scale-up

- On-site Process Hazard Analysis and Safety Testing on all processes at FFCC before startup
- Scale-up from a 1 liter specially designed Reaction Calorimeter which mimics process agitation and temperature control of our larger plant reactors
- RC-1 (Mettler Reaction Calorimeter)
- DSC (Differential Scanning Calorimetry)
- RSST (Reactive Safety Screening Tool)



# Quality Assurance & Control

## Quality Assurance

- ISO 9001:2015 certified quality system
- BQ9000 quality system for biodiesel
- GMP Capability



## Quality Control

- Full staff of chemists, technicians, and analysts
- Wide range of modern instrumentation
- 24/7 operations



# GMP Ready...again

- FutureFuel's Arkansas site was GMP qualified from 1994 to 2004 and supplied leading pharmaceutical companies with intermediates for human API's.
- Site is again GMP ready, as assessed by a 3<sup>rd</sup>-party pharmaceutical audit firm in July 2022.
  - Auditors affirm FFCC's past GMP compliance is a significant strength, and an advantage over other specialty chemical companies attempting to enter GMP
  - Growing demand for custom GMP manufacturing due to reshoring
- We can now support GMP projects for high value human and veterinary pharmaceuticals.



# Site Overview





# Environmental Commitment

## AIR

- 2 Regenerative Thermal Oxidizers and 2 Thermal Oxidizers to reduce air emissions
- Monitor 2800 VOC points
- Existing permits allow for significant expansion without need for modifications = more speed to commercialization

## WATER

- Waste water treatment facility on site

## SOLIDS/LIQUIDS WASTE

- Licensed RCRA hazardous waste incinerator on site
- Boiler capable of burning liquid waste
- Cost efficiency and speed



# Health and Safety Commitment

## **FutureFuel First Responders:**

- **Emergency Response Crew**
- **Fire Fighting Crew**
- **Paramedics**
- **Nurses**

## **Additional H&S Staff & Resources:**

- **Certified Industrial Hygienist**
- **Doctor**
- **Firefighting Training Center, also serving the Batesville Community**



# Raw Material Handling

We are equipped to handle many hazardous materials, including:

- Acetonitrile
- Acetaldehyde
- Acetic Anhydride
- Aluminum Chloride
- Benzene
- Bromine
- tert-Butyl Acryl Amide
- tert-Butyl Acrylate
- Chlorine
- Chlorobenzene
- Crotonaldehyde
- Dichlorobenzene
- Diethoxymethane
- Dimethylformamide
- DMSO
- Ethyl Mercaptan
- Formaldehyde
- 36% Hydrochloric Acid
- Hydrogen Chloride(Anhy Gas)
- Isophthalic Acid
- alpha-Methyl Styrene
- 30% Oleum
- Phenol
- Phosphorous Oxychloride
- Phosphorous Trichloride
- Propylene
- Sulfuric Acid
- Styrene
- Thionyl Chloride
- Vinyl Acetate



# Bulk Material Handling Capabilities

**Rail spur with space  
for 300 railcars**

**Monthly Capacity to  
handle**

**~900 Tankers**

**~200 Package Trucks**

**~400 Railcars**





# Manufacturing Resources

Development Scale



General Purpose Batch



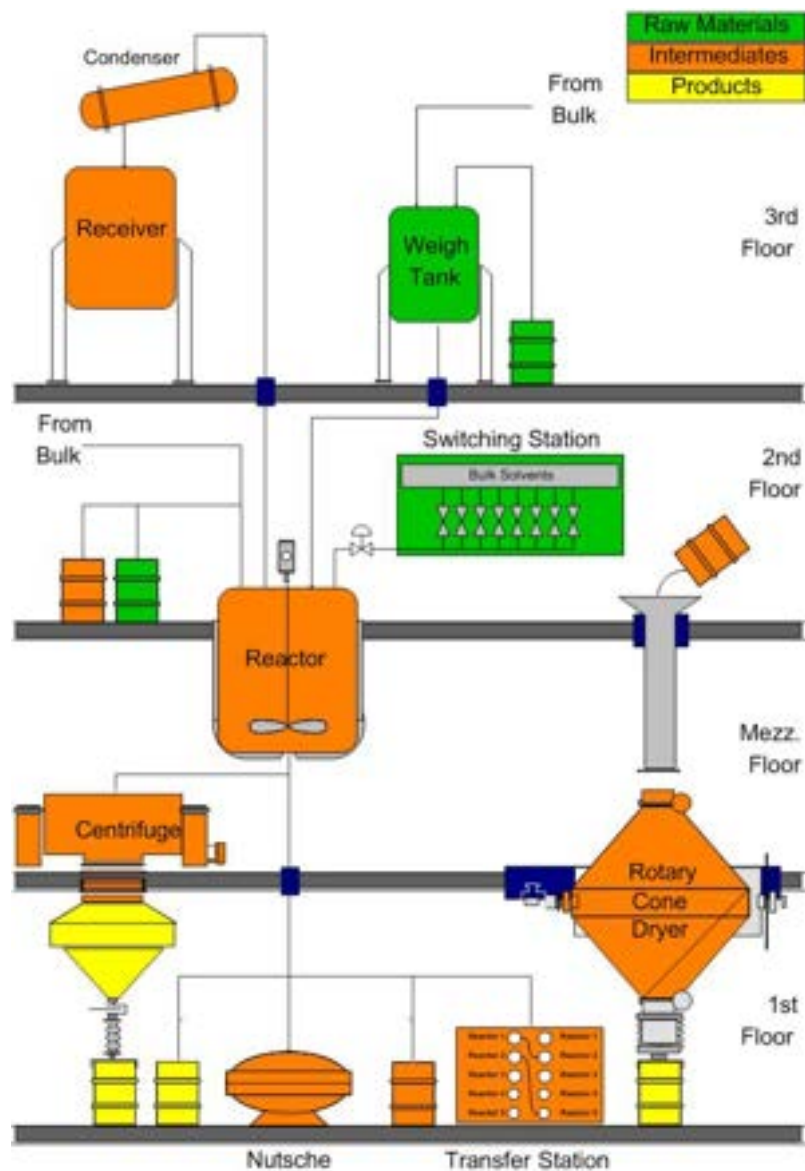
Dedicated Continuous



Dedicated Batch



# Batch Plant Equipment Layout



Centrally Located Control Room to Monitor and Control Operations



# Batch Plant Equipment

## Reactors:

- 66 Multipurpose GL & SS
- 1,000 gal (3785 L) to 3,000 gal (11,356 L)

## Distillation Stills:

- 8 GL & SS
- 1,000 gal (3785 L) to 3,000 gal (11,356 L)

## Distillation Columns:

- 20 Hastelloy, SS, Glass lined
- 0.3 m(1 ft) to 0.6 m(2 ft) Diameter
- 2.7 m (9 ft) to 4.6 m (15 ft) Tall

## Filtration Equipment:

- 36 Nutsches
- 13 Alloy C and SS centrifuges
- 3 AutoFilter Dryers

## Dryers:

- 10 Rotary cone vacuum dryers





# Continuous Plants





# Continuous Plant Equipment

## Reactors:

- 21 Glass Lined & Stainless
- 500 gal (1893 L) to 6,500 gal (24,600 L)

## Distillation Columns:

- 2 Glass Lined (36" X 62') (0.9 m X 18.9 m)
- 11 Stainless Steel (120" X 118') (3m X 36m)
- 5 Hastelloy (48" X 95')(1.2m X 29m)
- 1 Titanium (22" X 26') (0.6m X 7.9m)
- 1 Polymer Lined (18" X 36') (0.46m X 11m)

## Filtration Equipment:

- 9 Solid Bowl Centrifuges Stainless (largest 30" x 120") (0.76m X 3.0m)

## Dryers:

- 4 Ring Dryers
- 2 Plate Dryers/Coolers





# Utilities



# Utility Capabilities

## **FutureFuel:**

**Steam Supply - Five boilers @ 30, 60, 90, 150, 600 psig**

**Three Cryogenic Nitrogen Plants**

**River water: Cooling, fire-fighting**

**Liquid Waste Incinerator**

**Activated Sludge Waste Water Treatment**

## **Third Party:**

**Electricity: Entergy substation on-site (dual feed)**

**Natural gas: Macquarie**

**Potable water: Rock-Moore Public Water**



# Affiliations



ISO 9001 Registered  
No. FM 13127

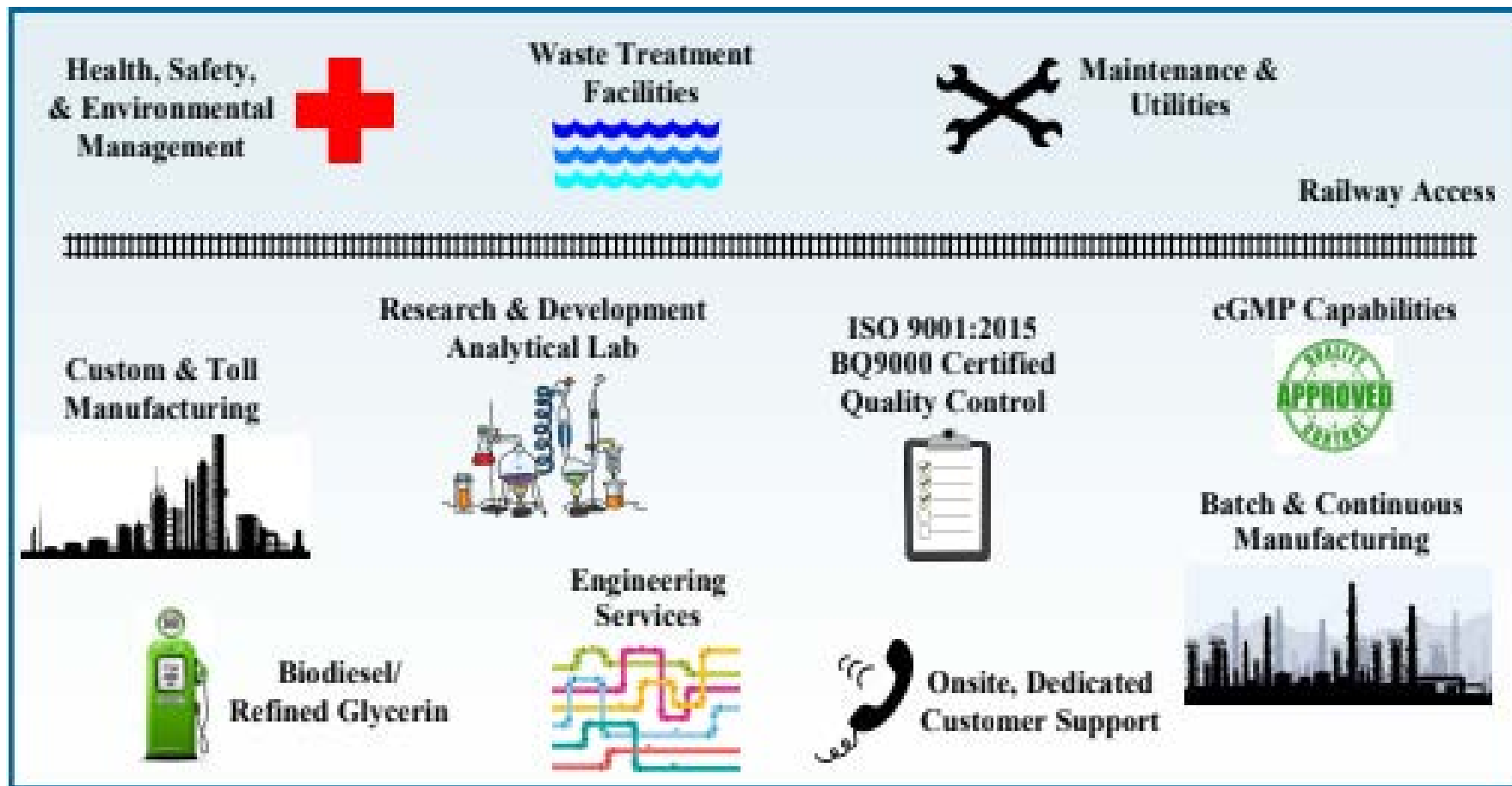


**RESPONSIBLE CARE**<sup>®</sup>  
OUR COMMITMENT TO SUSTAINABILITY





# “A Complete Package”



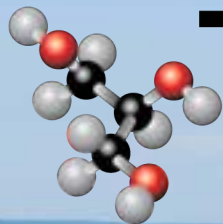
# FutureFuel Chemical Company

- Committed to safety, environmental stewardship, sustainability, and performance excellence.
- Proven capabilities, flexibility, and speed to commercialization.
- A world-class, full-service site, with exceptional people.
- Providing the “complete package”, to ensure our partners’ success.
- *Forbes 2023 Top 100 List of America’s Best Small Companies...again!!*





# ***FUTUREFUEL***<sup>®</sup>



## **CHEMICAL COMPANY**

***Superior chemistry. Sustainable fuels.***

Visit us at  
Booth 719