Ethanol Rail Transportation Review

- Ethanol Market Overview
- Ethanol and DDGS Impact on Rail Network
- Ethanol Supply Chain Components
- Potential Ethanol Supply Chain Constraints
- Managing Ethanol Rail Transportation
Ethanol Demand Drivers

- RFS Mandate
  - Political
- MTBE
  - Ban
  - Liability
- Extend Gasoline Stocks
  - Economics
  - Limited Refining Capacity
- Octane Efficiency

Source: USDA
Ethanol Production and Demand Markets

Production

2008

- IA/ MN/ NE: 45%
- IL/ IN/ OH: 23%
- Other: 19%
- CA: 2%
- ND/ SD: 11%

2015

- IA/ MN/ NE: 43%
- IL/ IN/ OH: 24%
- Other: 22%
- CA: 1%
- ND/ SD: 10%

Demand

2008

- TX: 9%
- South East: 24%
- North East: 33%
- Other: 21%
- CA: 13%

2015

- TX: 8%
- South East: 17%
- North East: 22%
- Other: 32%
- CA: 21%

Source: UPRR Estimate using various data sources
DDGS Production and Demand Markets

Production

- IA/ MN/ NE: 46%
- ND/ SD: 20%
- IL/ IN/ OH: 14%
- CA/TX: 5%
- Other: 15%

Demand

- CA/ ID: 12%
- TX/ KS/ OK: 25%
- Export: 10%
- South West: 5%
- IA/ MN/ NE: 22%
- Other: 34%

2008 vs 2015

Source: UPRR Estimate using various data sources
US Ethanol Biorefinery Locations

Source: Renewable Fuels Association
Key Ethanol Consumptive Markets

*Million Gallons Per Year – E10 Demand*

Northeast States Demand Grouped together

Source: DOE/ EIA
Ethanol Supplied by Rail

Rail Share of Total Ethanol Demand by Region

Source: UPRR Estimate using various data sources
DDGS Supplied by Rail

Rail Share of Total DDGS Demand by Region

Source: UPPR Estimate using various data sources
Ethanol & DDGS Impact on US Rail Volume
2003 - 2007

Source: AAR Originated Carloads
Ethanol Supply Chain Components

• Production Plant
  – 55 MGY generates 5 cars each of ethanol and DDGS per day
  – Track infrastructure

• Tank Cars

• Rail Network
  – Manifest/Gathered-Combo/Unit
  – Terminal Yards/Line haul

• Unload Terminal
  – Unload System and Tank Storage

• Truck Rack
Potential Ethanol Supply Chain Constraints

- Rail Line Capacity
- Rail Terminal/ Yard Capacity
- Unit vs Manifest Shipments
- Terminal Unload Capacity
- Pipeline Management
- Tank Cars
- Storage Capacity
Future Corridor Volumes Compared to Current Corridor Capacity

2035 Without Improvements

Note: Volumes are for the 85th percentile day

Source: National Rail Freight Infrastructure Capacity and Investment Study by Cambridge Systematics, Inc.
IA/MN Investment

- Active UP
- Under Construction
- Proposed
- Expansion
- Interchange

- New siding at St. James
- Mankato yard buildout
- Upgrader Tracks connect Mason City Sub to Fairmont Sub
- Double Track through Mason City
- Add two more track on the Upgrader
- Iowa Falls expansion
- Ft. Dodge Bridge upgrade to 263K

- Construct a five track support yard off Elk Creek Siding
- Sioux City Yard Expansion
- Butterfield Manual Interlockers
- Eagle Grove Yard Expansion
- Reconfigure Eagle Grove Diamond
- New siding and 3 track yard on the Tara Sub at Moorland
- Ft. Dodge Sub at Moorland
- Sioux City Sub
- Worthington Sub
- Roke Sub
- Estherville Sub
- Eagle Grove Sub
- Mason City Sub
- Albert Lea Sub
- St. Paul Sub
- Minneapolis Sub
- Kansas City Jct.
- Missouri Valley Sub
- Missouri Sub
- Fremont Sub
- Council Bluffs Sub
- New siding at St. James
Unit Train Efficiencies

Efficiency Example Assumptions

- Using 2007 AAR Ethanol data
- 40% Reduction in Tank Cars if Volume Moved Via Unit Trains

Unit vs Manifest Breakdown for US Ethanol Industry

Source: UPRR Estimate using various data sources
Estimated Unit Train Terminal Capacity

Maximum vs Current or Forecasted

Shaded Area Represents Current and Expected Operating Capacity

Source: UPRR Estimate using various data sources
# Constraints

<table>
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<th>Constraint</th>
<th>2006</th>
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<th>2015</th>
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<tr>
<td>Storage Capacity</td>
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- **Constraint**: The constraint is present.
- **Marginal**: The constraint is marginal.
- **No Constraint**: There is no constraint.
Managing Ethanol Rail Transportation

• Resource and Capacity Planning
• Pipeline Management
• Tactical Management Tools
Resource and Capacity Planning

- Site Development Assistance
- Guidelines for Rail Service to New Industry Locations
- Rail Access Approval Process
  - Links to Operating, Network Planning, Service Design, Engineering and Commercial Teams
- Capacity and Resource Evaluation
Rail Access Process

- Industrial Development contacted during site selection
- Commercial Team assesses rail transportation needs and requirements
- 10% Conceptual Drawing sent for approval
- Customer Service Profile submitted
- Memorandum of Understanding issued
- Exhibit A Prints / Construction Drawings submitted
- Track Inspection completed
- Industry Track Contract issued
Pipeline Management

• Ethanol Shipment Forecasting System
• Loaded and Empty Unit Train Coordination
• Tactical Management Tools
Ethanol Shipment Forecasting System

- 30 Day Rolling Forecast
- Update System as Changes Arise
- Provide Trace and Buffer Cars in System 24 Hours Prior to Release
- Provide Billing Prior to 9A Cutoff
Ethanol Shipment Forecasting System

**Compliance**
- Power Plan
- Crew Availability
- Corridor/ Terminal Capacity
- Train Slotting

**Non-Compliance**
- Power Imbalances
- Recrews/ Extras
- Crew Imbalances
- Power Repositioning
- Increased Fuel Consumption
Unit Train Coordination

- Customer Input into Forecast System
- Bulk Train Planner symbols Unit Train
- Weekly Communication with Load Facilities
- Resource Planning Based on Customer Forecast
- Daily Communication with Eastern Carriers
- Daily Communication with Unload Terminals
- Power Placement
- Crews Forecasted Several Days
Tactical Management Tools

• Bulk Train Planner (BTP)
  – Real Time Unit Train Monitoring
  – Efficient Coordination of Unit Train Resources

• Customer Inventory Management System (CIMS)
  – Proactive Management of Customer Car Flow

• Customer Operating Instructions (COI)

• Permit Distribution System (PDS)
  – U.S. Development Group (USD) System
  – Schedule and Control Traffic Flow into USD Terminals