The Biofuels Boom and its Impact on Highway and Rail Safety

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A Case Study in Minnesota: Freight Transportation in District 7

- Mn/DOT District 7; 13 Southwestern Counties
- Minnesota’s Corn Belt – Representative of the Central Midwest
- Steady and Significant Growth
- Responsive Management & Productivity
- Technology: Genetics, Communications
- Central to Established Economy & Renewable Energy Initiatives
D-7 Key Commodities – In Order of Importance (2005)

• Corn Production 358M Bushels (1/3 of Mn.)
• Soybeans 72M Bushels (1/3 of Mn.)
• Hogs – 5 million head (1/2 of Mn.)
• Ethanol – 186 million Gallons (1/2 of Mn.) (Minnesota third largest producing state)
• Non-Metallic Minerals – Silica, Kaolin Clay, Aggregate
• Manufactured Goods
Major Trends Impacting Freight

- Ethanol Expansion & Economics
- International Markets – Corn, Soy, DDGS
- Ongoing Growth in Agricultural Production; Responsiveness to Demand
- Grain Shuttle Trains & Elevators
- Inland Waterways Price & Capacity
- Oil & Natural Gas Supplies and Prices
- Cellulosic Ethanol
- Intermodalism
Growth in Freight Traffic

U.S. domestic freight tonnage growth forecast, 2000-2020

Source: USDOT
Intermodal Containers - Access Issues
Agricultural Equipment - Size & Weight
Vehicle and Shipment Sizes

- Grain Shuttle Trains
- Ethanol Unit Trains
- Railcar Size & Weight; 263K>286K>315K
- Truck Size & Weight; 80K>89K, axle loads
- Farm Equipment: Mega-combines, 5-axle
  Semis common (65% of farm delivery)
- Infrastructure Limits: Bridges, Local roads, Rail branches & sidings
- Barge Tows: Upper Mississippi Structures
Bio-Fuels Growth
National Distribution of Plants
Corn Ethanol Plants
# Ethanol Plant Expansion Vs. Corn Consumption

<table>
<thead>
<tr>
<th>YEAR</th>
<th>PLANT CAPACITY (Million Gals./Year)</th>
<th>% OF D-7 CROP YIELD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>186</td>
<td>19%</td>
</tr>
<tr>
<td>2006</td>
<td>252</td>
<td>25%</td>
</tr>
<tr>
<td>2007</td>
<td>380</td>
<td>33%</td>
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</tbody>
</table>
Ethanol Plant Characteristics

- Produces 40 million gallons/year of ethanol
- Produces 125 thousand tons/year of DDGS
- Consumes 15 million bushels of corn
-Collects grain from 30 mile radius
- 50-70 heavy commercial trucks per day
- 4-7 loaded railcars per day
- 10 days storage for corn on average
- Next generation plant – 100 million gallons/year
Ethanol Freight Flows

Corn
10 Tons

Plant

Truck

Storage

Tank Truck
Tank Car

Ethanol
3.2 Tons
(965 Gal.)

$1.90/Gal.

$6.10/Bu. Corn (Gross)

CO₂

DDGS
2.9 Tons

$122/Ton
Agricultural Logistics - Then & Now

**Historic**
- **Grains**
  - Export
  - Foods
  - Feeds
  - Rail/Barge
  - Truck/Rail
  - **Processor**
  - Truck

**Current**
- **Grains**
  - Truck
- **Storage**
  - Export
  - Foods
  - Feeds
  - Fuels
  - Rail/Barge/Intermodal
  - Truck/Rail
- **Pork Farrowing**
  - Truck
- **Feeder**
  - Truck
- **Processor**
  - Truck

International, U.S., Markets
## Concentration of Freight Traffic

<table>
<thead>
<tr>
<th>Plant Size</th>
<th>Trucks In/Day</th>
<th>Trucks Out/Day</th>
<th>Tankcars Out/Day</th>
<th>Hoppers Out/Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 MG/Year</td>
<td>50</td>
<td>10-20</td>
<td>2-4</td>
<td>2-4</td>
</tr>
<tr>
<td>100 MG/Year</td>
<td>125</td>
<td>25-50</td>
<td>5-10</td>
<td>5-10</td>
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</tbody>
</table>
## Economic & Market Effects

<table>
<thead>
<tr>
<th>YEAR (Planting Price)</th>
<th>CORN</th>
<th>SOYBEANS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>2.22</td>
<td>4.83</td>
</tr>
<tr>
<td>2001</td>
<td>2.44</td>
<td>5.23</td>
</tr>
<tr>
<td>2002</td>
<td>2.29</td>
<td>4.44</td>
</tr>
<tr>
<td>2003</td>
<td>2.42</td>
<td>5.34</td>
</tr>
<tr>
<td>2004</td>
<td>2.53</td>
<td>6.95</td>
</tr>
<tr>
<td>2005</td>
<td>2.27</td>
<td>5.53</td>
</tr>
<tr>
<td>2006</td>
<td>2.38</td>
<td>6.25</td>
</tr>
<tr>
<td>2007</td>
<td>3.96</td>
<td>7.01</td>
</tr>
</tbody>
</table>

(Market Low of $1.78/Bu., 2000)
Agricultural Response To Ethanol Growth; Transportation Impacts

- Corn-on-Corn Crop Rotation: up to 55% growth in production over next 5 years
- Genetics & Management: 15-35% growth in yield over next 5 years
- Projected Heavy Commercial Truck Trips grow 155-230% by 2030
- Farm-to-Market grain delivery grows from 80 to 160 Semis per square mile annually
- Cellulosic Ethanol Feedstocks could increase tonnage 2-5X (>five years)
Agricultural Growth & Trucking

Trends in HCADT Growth (Market Price-Driven Grain Yields)

- **Base Line Projection**
- **Yield Increase - Low**
- **Yield Increase - High**

% Growth vs. Years

Yield growth projections for different scenarios are shown from 2005 to 2030.
Safety Issues

• TRAFFIC-Potential doubling of heavy trucks, 30-60% growth in rail carloadings
• GRADE CROSSINGS-Increase in 5-axle 80,000 lbs. trucks, non-professional drivers (farmers), increase in train volumes, rural/unimproved crossings
• HAZARDOUS MATERIAL-Ethanol as Class 3 Flammable Liquid
Grade Crossing Safety

Trains Can’t Stop.... YOU CAN!
Courtesy Wisconsin & Southern Railroad

Look & Live
Operation Lifesaver®
Ethanol Characteristics

- HazMat USDOT Class 3 Flammable Liquid (UN 1170)
- Stable at normal temperatures and pressures
- Relatively inert-chemically benign
- Low toxicity-requires significant internal ingestion
- Non-carcinogenic
- Bio-degrades in sunlight, hydrolyzes in water
- Non-pollutant in water, except for denaturing component
- Burns at low temperature
Case Study-Fallston, PA; Beaver Valley Derailment
Minimizing Risk in Transport

- Professional, certified tank truck drivers
- Operation Lifesaver and FMCSA programs
- Rail transport for volumes, distance (safety record excellent)
- Rail & Roadbed condition & inspection
- Infrastructure investment-Roads, Rail, Bridges, Crossings
- Enforcement
## Opportunities - & Challenges

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<th>Opportunities</th>
<th>Challenges</th>
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<tr>
<td>Preserve Rail Capacity</td>
<td>Private Infrastructure (Public road, Waterways)</td>
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<tr>
<td>(Minnesota Prairie Line)</td>
<td>Local Road Condition (1950’s design, 3-season)</td>
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<tr>
<td>Efficient Trucking</td>
<td>Dispersed Network (Low Funding, Awareness)</td>
</tr>
<tr>
<td>(Farm-own, 5-axle Semis)</td>
<td>Local Access Points</td>
</tr>
<tr>
<td>Safety &amp; Security</td>
<td>Grade Crossing Safety</td>
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<tr>
<td>(Rail Transport - Ethanol)</td>
<td>Maintain Mix of Modes</td>
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<td>Intermodal Growth</td>
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<td>Accident Reduction</td>
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<td>Energy Efficiency</td>
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National & Local Significance

• Boom in Energy & Agriculture – Growing National Significance (ethanol, wind, solar)
• Integrated Freight Network Needed at Both Local & National Level-capacity & safety
• Rural Infrastructure & Resources Falling Behind Accelerating Transportation Needs
• Safety, Energy Conservation, Environment all served by Freight Network Investment and Policy Support
Questions