Manure Equipment and Rural Roads: PNAAW Road Research

Kevin Erb
University of Wisconsin-Extension
2001: Professional Nutrient Applicators Assn of Wisconsin (PNAAW) i’d 3 priorities:

- Industry regulation / licensing
- Liability insurance
- Impact of equipment on rural roads
Background

- Existing studies examined, found lacking
- Began to explore creating new research
Background

- Contacted DOT in 8 states
- Examined existing testing facilities
- Chose to partner with MN DOT
  - Existing research facility (MnROAD)
  - Similar needs identified
Interesting Beginnings
Examining the problem.
Creating the Research
Pooled Fund Study

- 4 year, $630,000 project
- Industry provided:
  - Equipment (tractors, tankers, pumps)
  - Experienced drivers
  - Technical expertise
Study Partners

- AgCo, CaseIH, Deere
- Houle, Husky
- Firestone, Michelin, Titan
- Applicators: IA, OH-IN, MN, WI
Study Partners

- MN Pork Producers
- Professional Dairy Producers of Wisconsin
- DOT
  - Illinois, Iowa, Minnesota, Wisconsin
MN: 80,000 LB

S1/S5: 4400 gal

MN: 102,000 LB

S2/S4: 4400 gal
T1: 6000 gal (Houle)

T2: 4000 gal

T3: 6000 gal (Husky)

G1: 1000 Bushel
T4: 7300 gal

T5: 9500 gal
S3: 1800 gal

R4: 2400 gal

R5 (8144): 2300 gal

R6(3104): 4200 gal
### Weights

<table>
<thead>
<tr>
<th>Vehicle ID</th>
<th>Type</th>
<th>Vehicle Make</th>
<th>Size</th>
<th>Gross Weight</th>
<th>Max Axle Weight</th>
<th># of Axles</th>
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</thead>
<tbody>
<tr>
<td>S4</td>
<td>Straight Truck</td>
<td>Homemade</td>
<td>4400 gal</td>
<td>65622 lb</td>
<td>24678 lb</td>
<td>3</td>
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<tr>
<td>S5</td>
<td>Straight Truck</td>
<td>Homemade</td>
<td>4400 gal</td>
<td>62220 lb</td>
<td>23474 lb</td>
<td>3</td>
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<tr>
<td>S3</td>
<td>Terragator</td>
<td>AGCO Terragator 8204</td>
<td>1800 gal</td>
<td>49246 lb</td>
<td>34000 lb</td>
<td>2</td>
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<tr>
<td>R4</td>
<td>Terragator</td>
<td>AGCO Terragator 9203</td>
<td>2400 gal</td>
<td>58018 lb</td>
<td>43742 lb</td>
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<tr>
<td>R5</td>
<td>Terragator</td>
<td>AGCO Terragator 8144</td>
<td>2300 gal</td>
<td>47100 lb</td>
<td>29950 lb</td>
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</tr>
<tr>
<td>R6</td>
<td>Terragator</td>
<td>AGCO Terragator 3104</td>
<td>4200 gal</td>
<td>74700 lb</td>
<td>41900 lb</td>
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<tr>
<td>T1</td>
<td>Tanker</td>
<td>John Deere 8430 w/ Houle tank</td>
<td>6000 gal</td>
<td>81320 lb</td>
<td>29044 lb</td>
<td>4</td>
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<tr>
<td>T2</td>
<td>Tanker</td>
<td>Massey Ferguson 8470 w/ Husky tank</td>
<td>4000 gal</td>
<td>64028 lb</td>
<td>20042 lb</td>
<td>4</td>
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<tr>
<td>T6</td>
<td>Tanker</td>
<td>John Deere 8230 w/ Husky tank</td>
<td>6000 gal</td>
<td>89600 lb</td>
<td>33900 lb</td>
<td>4</td>
</tr>
<tr>
<td>T7</td>
<td>Tanker</td>
<td>Case IH 335 with Houle tank</td>
<td>7300 gal</td>
<td>105200 lb</td>
<td>26300 lb</td>
<td>5</td>
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<tr>
<td>T8</td>
<td>Tanker</td>
<td>Case IH 335 with Houle tank</td>
<td>9500 gal</td>
<td>134200 lb</td>
<td>25200 lb</td>
<td>6</td>
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<tr>
<td>G1</td>
<td>Grain Cart</td>
<td>Case IH 9330 with Parker 938 cart</td>
<td>1000 bushels</td>
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<td>Mn80</td>
<td>Semi Truck</td>
<td>Navistar</td>
<td>NA</td>
<td>80150 lb</td>
<td>17800 lb</td>
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<tr>
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<td>Mack</td>
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Proactive Solutions
Changes made

- Applicators & farmers work with Wisconsin towns and counties to make roads one-way for manure hauling
- Safer, 20% more loads/hr
Changes made

- Planned ahead of time
- Farmer notifies road users (school bus, neighbors), town notifies emergency responders

credit: www.ricesigns.com
Shoulder Driving Discussion

- Integrated, paved shoulders make a big difference, if...
  - Connected, built to same standard as main road

- 1’ asphalt on mud will not protect the road

Note where tire is in relation to shoulder edge!
Edge Eaters

- **Issue:** weight on edge AND de-acceleration

- **Solutions:**
  - Closing road and parking in middle
  - Paved pad for transfer
Edge Eaters: De-acceleration
Edge Eaters

- Cut thru road ditch
- Turning in and out of driveway
  - Driveway entry
  - Far edge where equipment turning wide runs on shoulder
Edge Eaters

- Solutions
  - 60’ culverts
  - Enter field only at driveways
Moved and Shared Driveways
Moved and Shared Driveways

Field 1

Field 2

Field 3

Field 4

50 ft culvert

5 ft paved field driveway entry
Seasonal Differences

- Avoid critical times of year
  - When frost is leaving the subgrade
  - When road subgrade is wet

- Consider critical time of day
  - Less damage in morning than afternoon
Rebuilding roads near farms

- Farms need to invest up front to prevent problems
Selective Investment
Selective Investment
Selective Investment

- Invest in high quality subgrade / surface
  - Acceleration
  - Deceleration
  - Turning / driveways

- Pave shoulders at turning points
Selective Investment

- Longer culverts at field and farm driveways with paved shoulders
Bottom Line

- Steps you can take to reduce damage:
  - Don’t drive right on the pavement edge
  - Avoid weak subgrade (frost thaw, saturated)
  - Balance axle weights
    - Steerable axles not looked at in study, but they do make a difference
Bottom Line

- Long term solution needs to involve farmers, towns/counties and the industry
Bottom Line

- Innovation needed given time crunch in our narrowing application window

- Knee-jerk reactions (no hauling in spring, etc) need to be proactively prevented
Thank you!

Kevin Erb
kaerb@wisc.edu