ADVANCED ASPHALT EMULSION TECHNOLOGY FOR PAVING APPLICATIONS 2009

ODOT Item 407 Tack Coat

- Description "Preparing and treating a paved surface with asphalt material and cover aggregate if required."
- Materials RS, SS, CRS, CSS and Polymer tack.

Tacking Process

- Placement of an adhesive layer of asphalt on existing pavement or a milled surface
- Adheres pavement layers together
- Absorbs dust which negates adhesion

Machinery

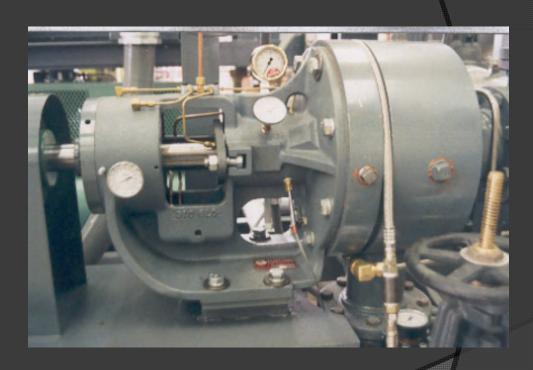
- Distributor truck
- Heated tank
- Circulation
- Spray bar & Wand
- On board computer





Asphalt Emulsion Composition

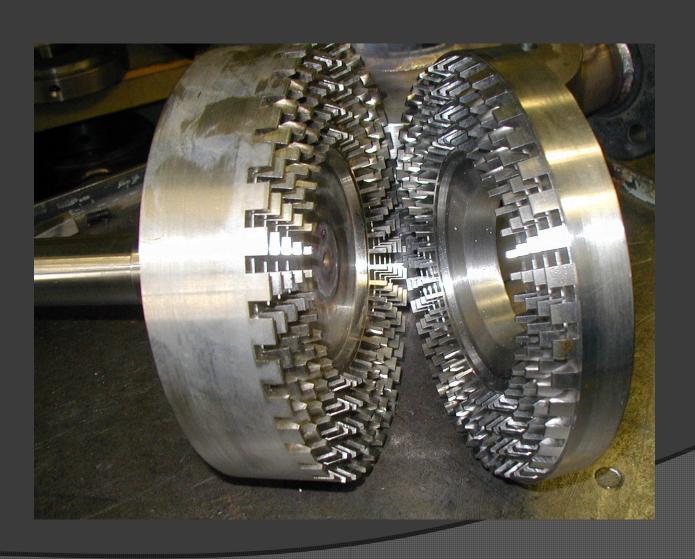
- A colloidal suspension of asphalt (solid) in water (liquid)
- Water is treated with chemicals to make it a "soap"
- Heated asphalt is pumped through a colloid mill and sheared into small particles (1-10 micron)
- Asphalt particles are suspended in the soap water



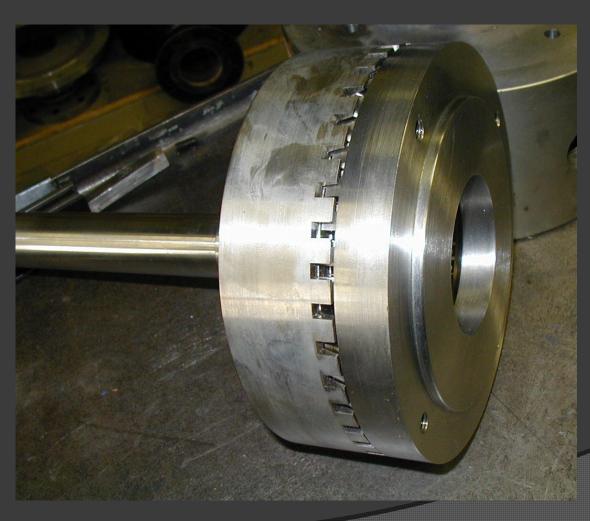
Rotor & Stator Plates



Rotor & Stator Plates



Gap Setting Determines Particle Size and Distribution



High Performance Emulsion Mill



Photos Courtesy Dalworth Machine Product

The "Breaking" Process

- After the emulsion is applied the water is absorbed by the substrate and evaporation
- As the water content decreases, the asphalt particles coalesce
- Eventually almost all the water evaporates and the asphalt residue is left on the pavement

Photomicrograph of Asphalt

Emulsion





Asphalt Emulsion Grades

- SS = Slow Set (anionic)
- RS = Rapid Set (anionic)
- CSS = Cationic Slow Set
- CRS = Cationic Rapid Set

SS-1 Asphalt Technology

- Use Began in Early 20th Century
- Set Time 30-120 Minutes
- Spray Pattern Problems
- Tracking Problems
- Film Thickness Inconsistent



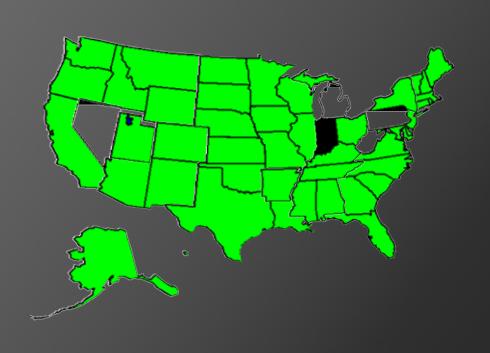




AAPT Report

- Worldwide State of Practice on the Use of Tack Coats
- Louay Mohammed LSU

STUDY INCLUDED MOST US STATES & HEAVY FOREIGN USERS



Standard Tack Coat Practice In The US

- Most States Require Tack Coats Between Asphalt Layers
- Most Use SS-1 or Similar Emulsion
- Most Allow Dilution
- Residual Rates Vary From .03 .05 gal/sy

Pick Up Of Tack Materials (Tracking)

- 76% Report On-going Problem
- 38% Require Complete Set Before Allowing Trucks
- Some States Mandate Sanding
- Some States Allow Trucks To Drive on Unset Tack

Percentage of Coverage

- Only 37 % Mandate 100%
- 27% Report >90%
- 36% Report <90% Coverage

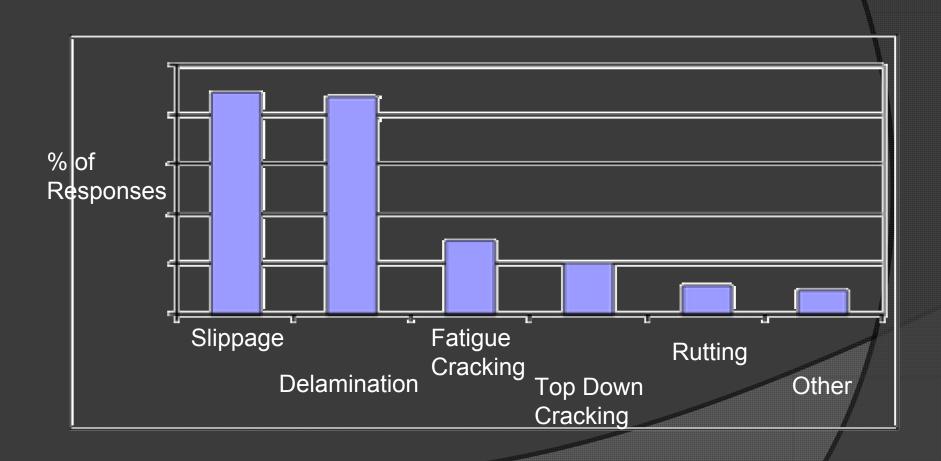
Spray Nozzle Overlap

- 73% No Requirement
- 25% Require Spray Overlap

Negative Implications

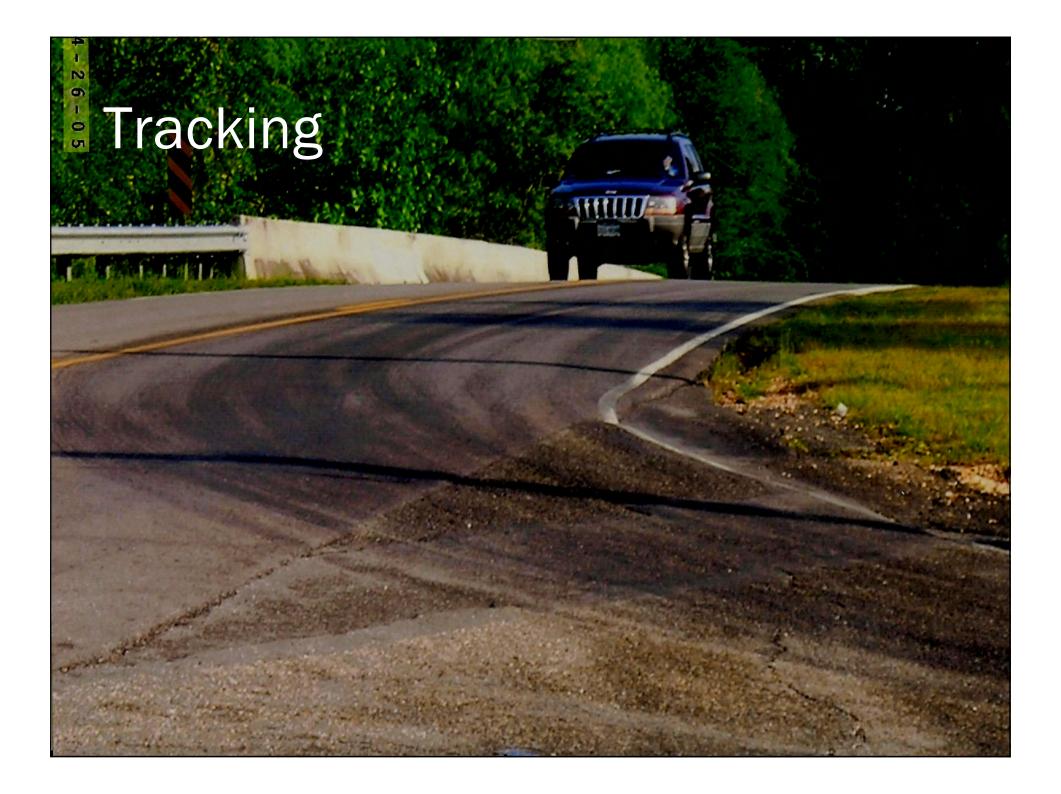
- Inconsistent Density
- Slippage
- Delamination
- Premature Fatigue

Failures Related To Improper Tack Coat Application



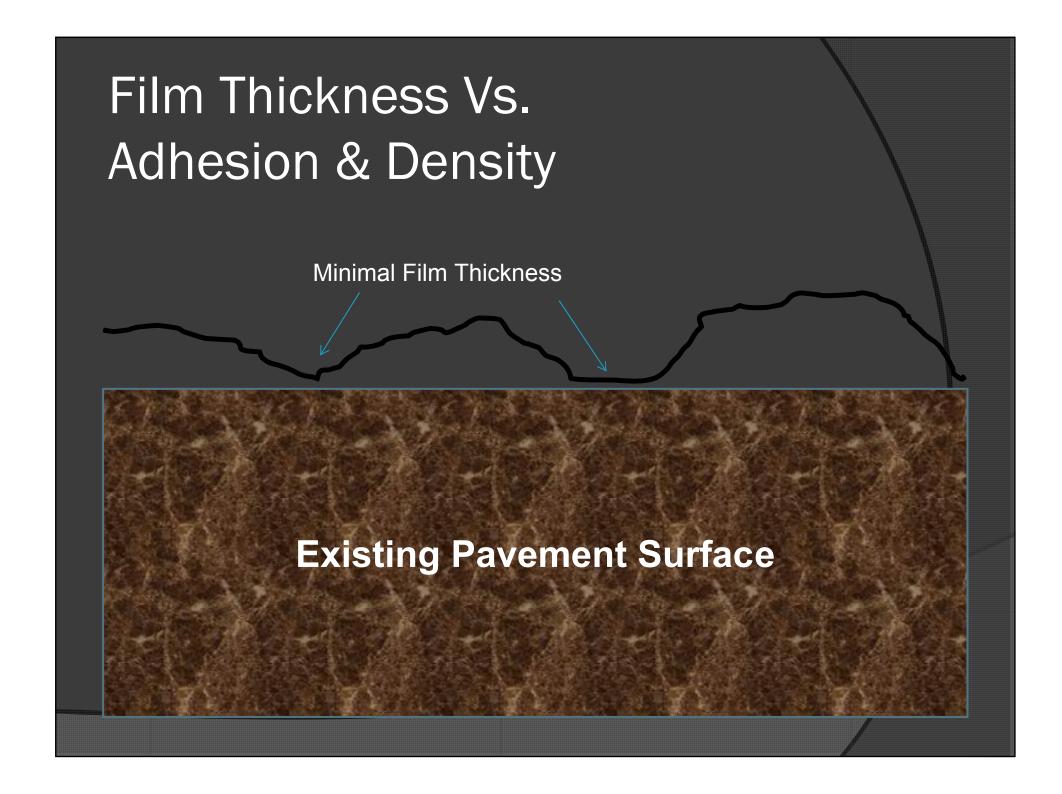
Tack Coat Issues

- Tracking
- Film Thickness
- Adhesion
- Density









New Emulsion Technology

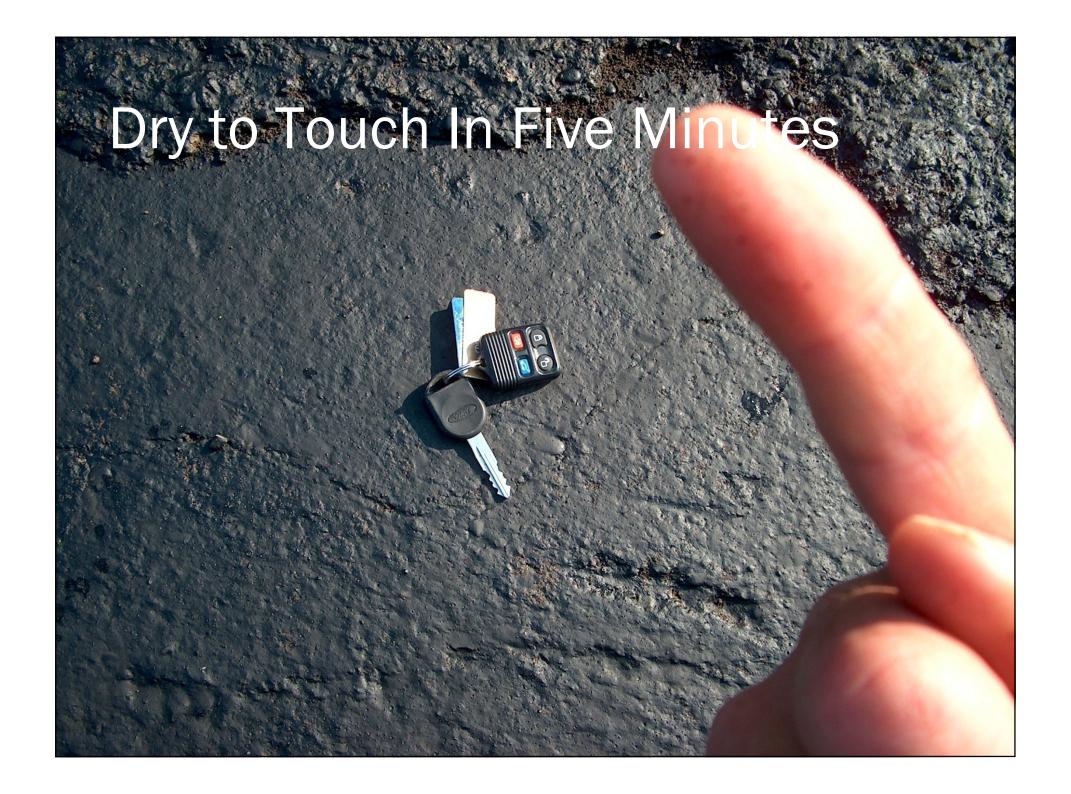
- Harder Asphalt
- Stronger Polymers
- New Emulsion Techniques
- Born From Aerospace Coatings

Break Time Comparison

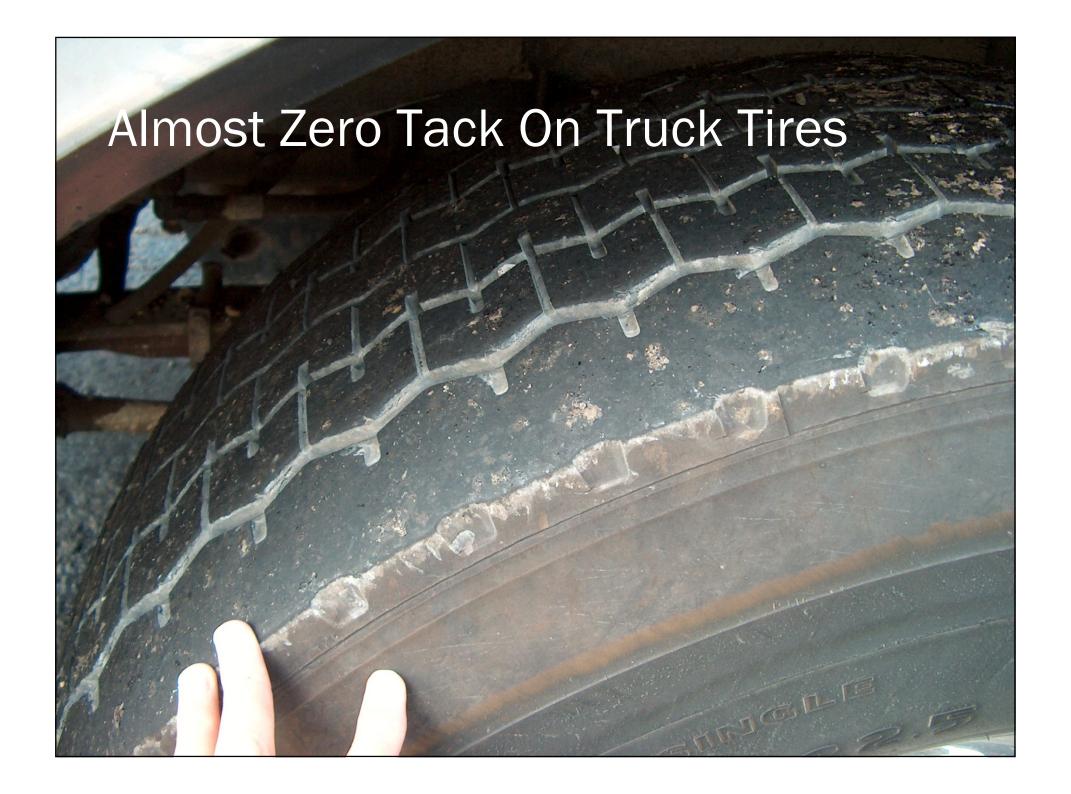
- Standard Emulsions 30-90 Minutes
- NTSS-1HM 5-15 Minutes

Adhesion Comparison

Tack Type	Core ID	PSI
RS-1	1-1	70
	1-2	121
	1-3	116
	1-4	87
	1-5	105
	1-6	95
NTTSS-1H	2-1	61
	2-2	188
	2-3	178
	2-4	178
	2-5	161
	2-6	150
Average	RS-1	99
	(Section1)	99
	NTTSS-1H (Section 2)	153



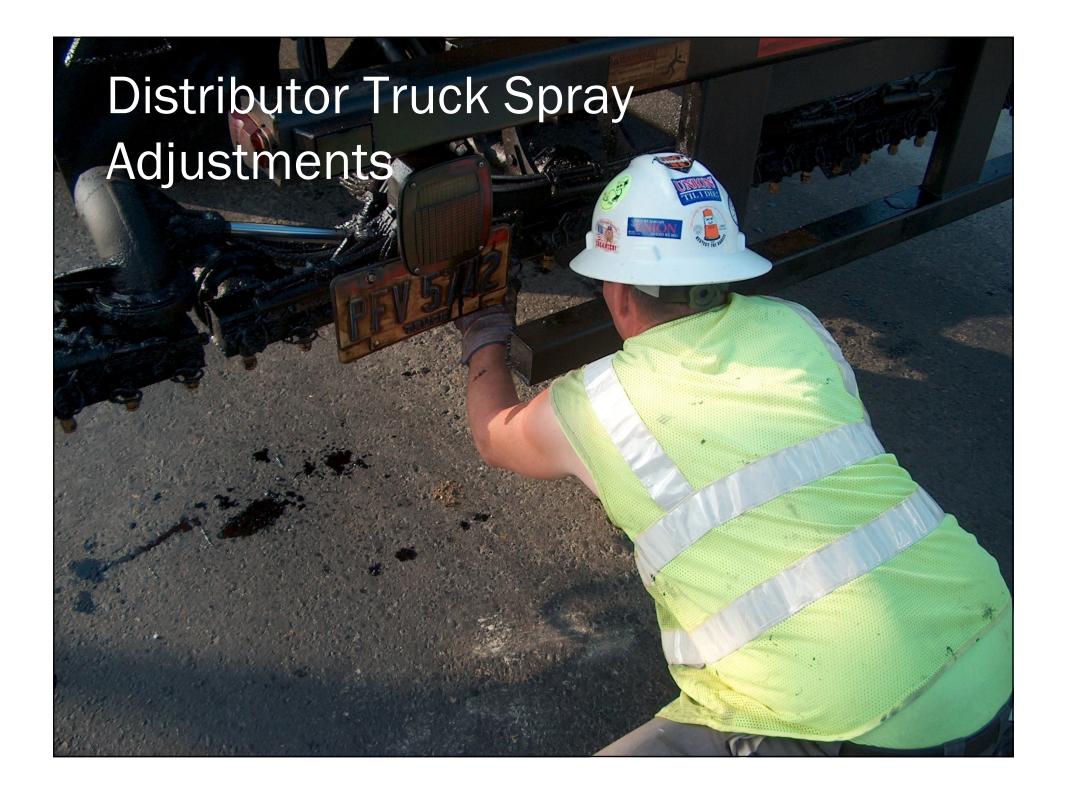






Improved Application Practices

- Better Nozzles
- Improved Spray Pattern
- Specific Application Temperatures
- Complete Coverage





Cost

- Adds About \$1.00 per gallon
- Approximately 1% of paving cost
- 10,000 sy project uses .075 gal/sy on milled surface and .04 gal/sy on intermediate
- Total .115 gal/sy for a two course overlay
- 1150 gallons, \$1200 -1700 additional dollars

Trackless Tack

- New Polymerized Emulsion Tack Coat
- Dries Tackless in less than 15 Minutes
- Increases Bond Between Layers 40%
- Promotes Uniform Density
- Maintains Density on Pavement Edges
- Tack 24 Hours Ahead
- Facilitates MOT
- Speeds Up Paving Operations

References Available

- Shelly Company Superintendents
- ODOT Project Manager

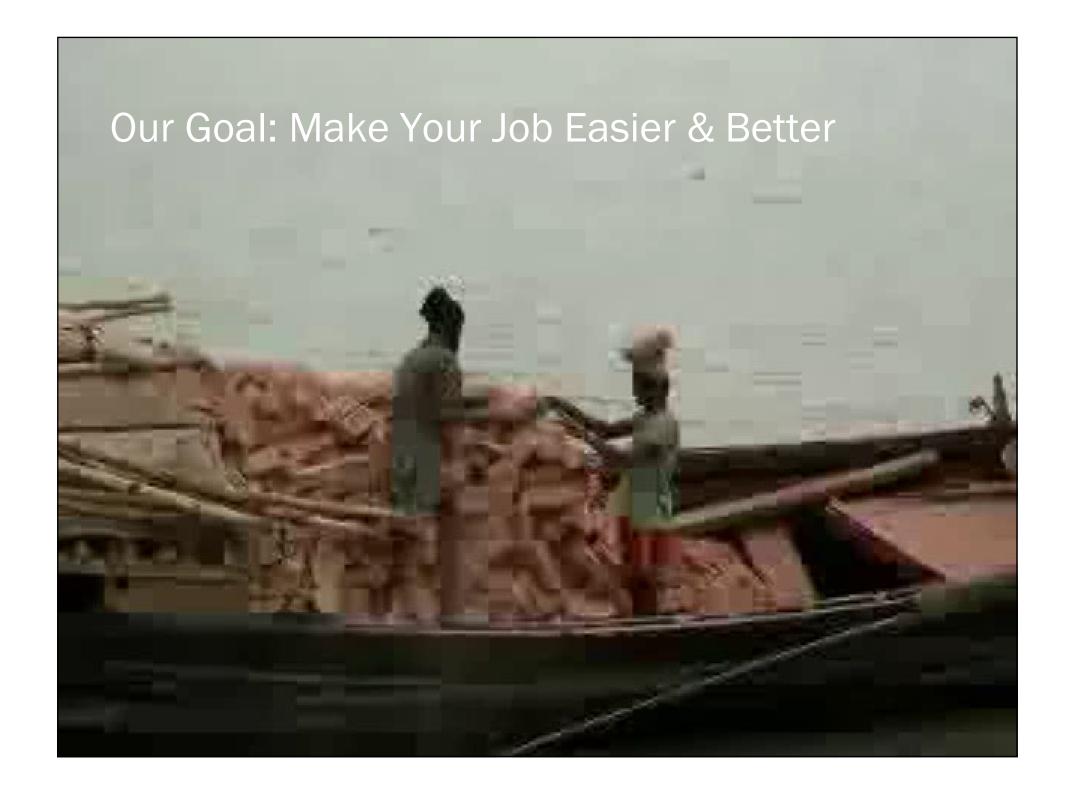
Specifications Available

- Word Format or PDF
- Available Via Email tletizia@roadrunner.com



Strategic Partnering To Solve Engineering Challenges

- Trust
- Information Sharing
- Competence
- Performance



Thank You

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