Friction Modifier Material Evaluation Practices

ICRI WebEx Topic Introduction

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Outline

- Introduce current status of friction modifying material development and evaluation
- Set objectives for laboratory testing
- Review current practice of field evaluation
- Use of field trail results in refining laboratory objectives

Goal

- Create a lab testing regime to qualify materials
- Create a best practice for setting up field trials

Current State of Friction Modifier Evaluation

From a railroad's perspective:

- No standard testing protocol of material properties and performance criteria is available for manufactures to use in development of friction modifying materials for railroad use
- Many manufacturer's use tests designed for different applications of greases and lubricants which provide useful information about a particular product, however, these tests often do not represent performance in a wheel/rail environment
- Based on National Lubricating Grease Institute, NLGI

Consequently,

- Products cannot be qualified or differentiated prior to field testing
- Suppliers spend time and resources creating and marketing products based on their perspective of success
- Consumers must vet out many products which is time consuming, costly, and non-standard

Objectives for Laboratory Testing

Grease – material used at the gage corner of the rail, protects wheels and rail from wear due to high curving forces

Top-of-rail friction modifier (TOR) –

material used on the top-of-rail to control frictional forces of the wheel/rail interface

Material Stability – will the product components separate

- Report temperatures at which the properties of the material changes

Grease – characterize the tackiness and stringiness

Material Mobility – will the product move; in tank, through pump, to track

Grease – needs to pump at low temperatures, standup in high temperatures

stick to rail/wheels at all temperatures

Objectives for Laboratory Testing

Rheological Properties –

- Use of testing devices standard to material manufacture – pin on disk, penetration
- Expanded use of Amsler-type twin disk tribometer
  - Could allow for performance evaluation of modifier material
  - Test various parameters
    - How long does a material remain effective
    - How much damage occurs with a set number of cycles and application

Other common testing?

Current Practice of Field Evaluation

Selection of Location –

- Consistent traffic mix
- Predominate flow of traffic in one direction
- Moderate to high degree of curvature over the distance to be evaluated
  - Typical distances 2, 4, 8 – mile spacing of application sites
  - Curvature – common to report a normalized total angle of curvature based on degrees and length of curves
- Accessible
- Consistent and predictable environmental factors

Units and Products –

- Reduce introduction of unnecessary variables
- Reliable equipment
- Frequent monitoring

Duration –

- Consistent number of axles for each product

Current Practice of Field Evaluation

Product Evaluation Criteria:

- Carry distance – how far a product can been seen away from the application area
- Time to saturation & dry down
- Product delivery to the wheel/rail interface
- Product pick-up and waste
- Product pumpability
- Each point above is documented over the life of the trial

For Greases:

- Swipe test to see evidence of product on the rail at prescribed locations
- Portable tribometer used to supplement swipe test

For Friction Modifiers:

- Rail forces monitored at selected instrumented sites
- Compare times with product to baseline force data (lateral forces)

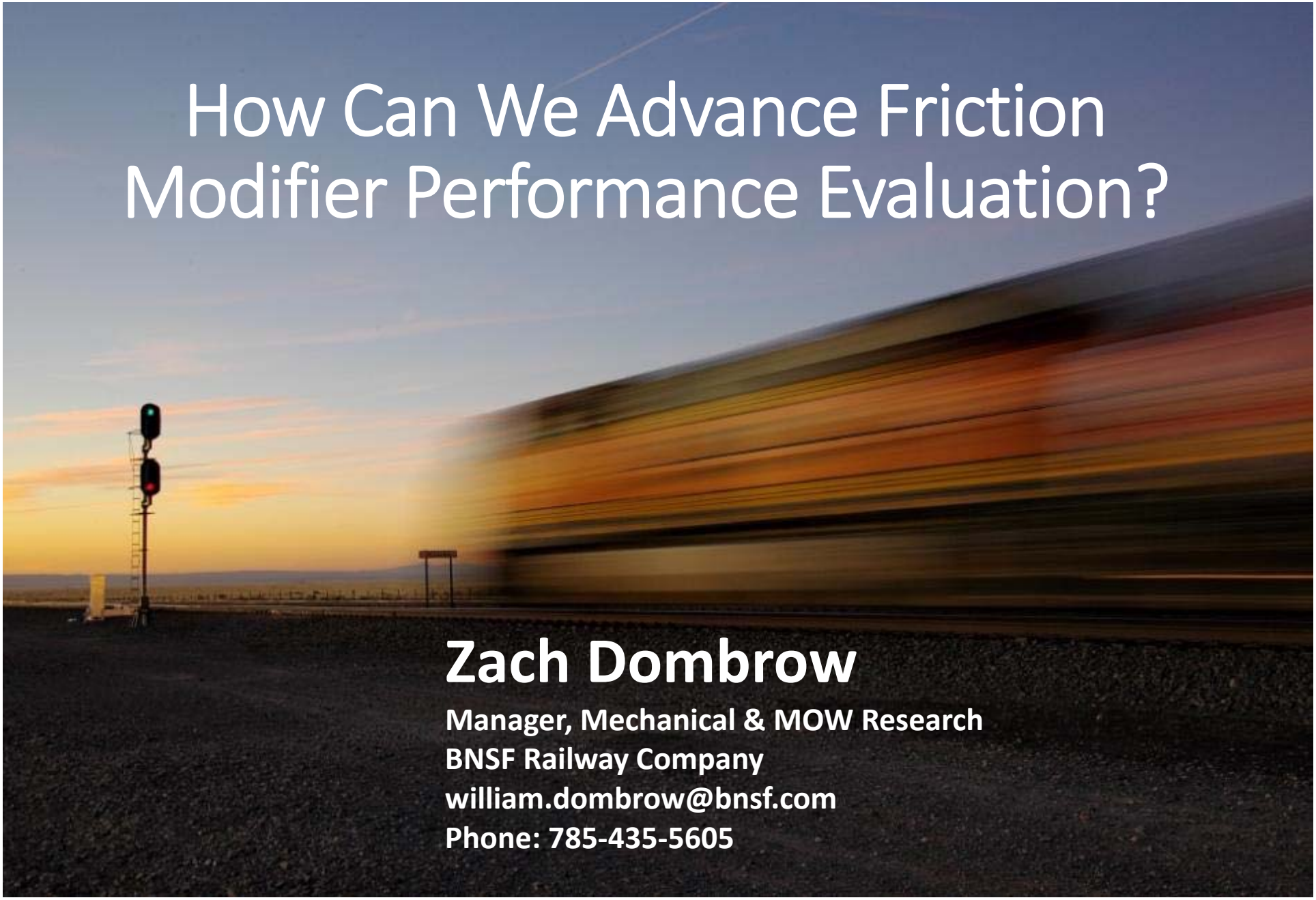
Field Trials Refine Laboratory Objectives

After field trails are concluded on various products:

- Results should be shared with the supplier/manufacturer
- Compare trial results with laboratory expectations
- Create benchmarks for accepted laboratory testing based on the field evaluation of superior performing materials

Does the laboratory testing regime adequately represent the field trail performance?

How Can We Advance Friction Modifier Performance Evaluation?



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