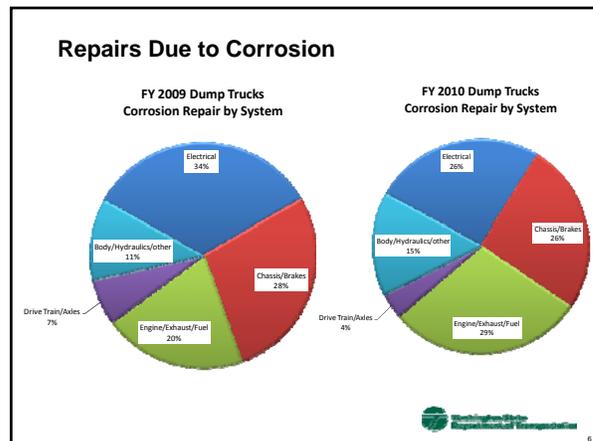
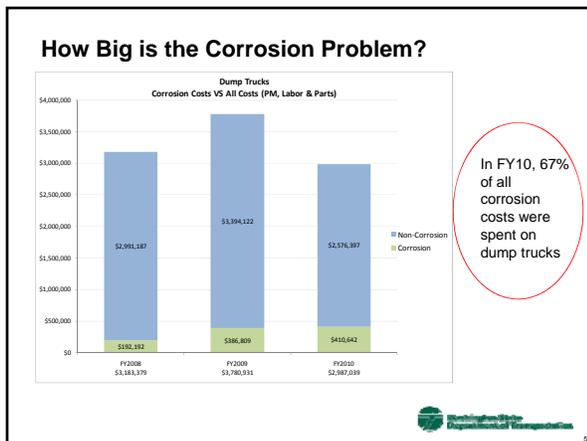
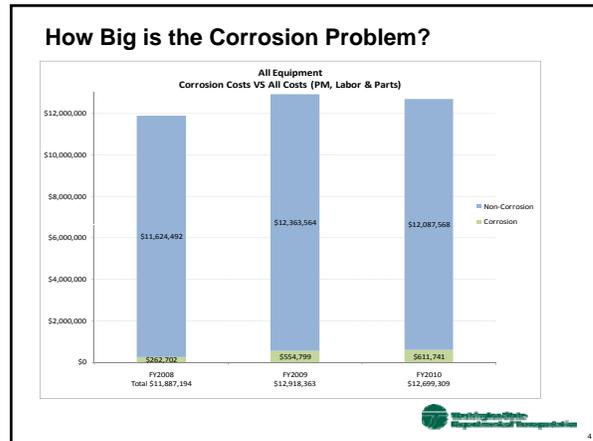
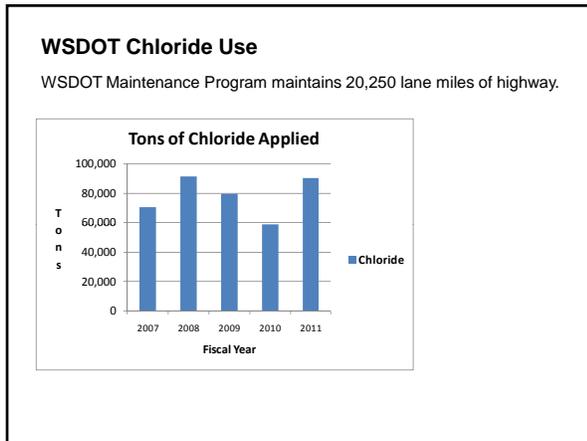




### Identifying the Impacts of Corrosion

1. How big is WSDOT's corrosion problem?
2. How much chloride are we using?
3. What is WSDOT doing to minimize impacts of corrosion?
4. What about washing vehicles?
5. Chloride inhibitor testing results.



### What TEF is Doing to Minimize the Impact?

The best way to prevent corrosion is to be proactive

- Electrical Issues**
  - Removed electrical junction boxes on 2005 and newer trucks.
  - Installing sealed wiring harness front to rear.
  - Moved the Electronic Control Module (electronic brain) inside cab.
  - Using plastic or composites instead of metal, whenever possible.
  - Using Dielectric grease on all electrical connection points.
  - Installing Weather Pack electrical connectors at all connection points.
  - Installing sealed LED lighting.
- Chassis/Brake Components**
  - Installing corrosion sealed air brake chambers.
  - Seal older style and replace with new style when necessary.
  - Spraying on protective coatings on all brake valves.
  - Inspecting all brake components during servicing.

FY 2010 Dump Trucks Corrosion Repair by System

System	Percentage
Electrical	26%
Chassis/Brakes	26%
Engine/Exhaust/Fuel	23%
Body/Hydraulic/Other	15%
Drive Train/Axles	4%

### What TEF is Doing to Minimize the Impact? Continued...

- Chassis/Frame/ Body/ Beds**
  - Powder coating wheels, fuel tank and frame rails.
  - Removed all junction boxes from dump beds and frame.
  - Installing zinc nickel alloy engine oil pan.
  - Installing grit guards on wheels (prevents wheels from rusting together and to the axle hub).
  - Using stainless steel hoppers and components in lieu of mild steel.
  - Wrapping hydraulic fittings with anti corrosive wrap.
  - Sealing frame rail split.
  - Installing a large full width, full height under chassis sand guard on all front discharge sanding bodies.

FY 2010 Dump Trucks Corrosion Repair by System

System	Percentage
Chassis/Brakes	26%
Electrical	26%
Engine/Exhaust/Fuel	23%
Body/Hydraulic/Other	15%
Drive Train/Axles	4%

### What About Washing?

It does not appear that washing alone will prevent all corrosion

Fiscal Year 2009 Class 06 (Dump Trucks)  
Average Corrosion Cost vs Chlorides Applied  
Hyak vs White Pass

Location	Tons of Chloride Applied	Average Corrosion Cost Per Dump Truck
White Pass	2,224	\$3,169
Hyak	5,911	\$3,737

### What About Washing?

Routinely washing the material off is a good way to prevent the chemical cycle from continuing.

- We should continue washing vehicles, concentrating on trouble spots such as frame rails, brake components and other areas that tend to collect materials.
- We need to take advantage of low cost alternatives currently available.

### What About Washing? Continued...

22' of 1" heater hose

### Corrosion Research

- WSDOT Sponsored Pooled Fund Research**
  - "Inhibitor Longevity"
- WSDOT/Alaska University Transportation Center(AUTC) Research**
  - Best practices for corrosion prevention to Winter Maintenance Equipment

### WSDOT Sponsored Pooled Fund Research

#### 1) Inhibitor Longevity Research Problem Statement

- Each year the U.S. uses approximately 15 tons of deicers and spends 2.3 billion to keep the roads clear of snow and ice.
- Motorist and trucking associations have become wary of deicers.
- On average, the deicer corrosion to each vehicle was estimated to cost \$32 per year.
- Has been known to cause corrosion damage to transportation infrastructure.
- The cost of installing corrosion protection measures in new bridges and repairing old bridges in the Snowbelt states is estimated between \$250 million and \$650 million annually.
- Indirect cost are estimated to be greater than ten times the cost of corrosion maintenance, repair and rehabilitation.



13

### WSDOT Sponsored Pooled Fund Research

#### 1) Inhibitor Longevity Research Objectives

- What is the longevity of the corrosion inhibitors, when in storage or on the road?
- What is the duration the inhibitors remain with the deicers when applied to the road?
- What are the effects of storage (temperatures, UV intensity, exposure time, and type of deicer) on inhibitor longevity and effectiveness?
- Do the inhibitors contribute to the freezing point suppression or improve the effectiveness of deicers?
- How does the laboratory test protocol correlate with the deicer performance in the field?
- What is the most effective product to use and its optimal application rate to combat ice formation, under each typical road weather scenario identified by the sponsor states?



14

### WSDOT Sponsored Pooled Fund Research

#### 1) Inhibitor Longevity Research Findings

- The three liquid deicers investigated did not lose their quality over the 14 months of field storage, regardless of the storage condition (mixed or non-mixed).
- The investigated inhibitor packages did not show any benefit in suppressing effective temperature or in providing ice melting capacity and they served merely as corrosion inhibitors for the deicer products.
- The longevity of chlorides and inhibitors on the pavement after deicer application can vary greatly. Fate and transport of chlorides and inhibitors in the operational environment seem to differ from each other. They are affected by traffic, type and condition of pavement, precipitation, deicer type and application rate, pavement temperature, and many other factors.
- Unofficial findings: Correlation of lab and field research remains a challenge. No reliable product performance assumptions can be drawn from this research.



15

### WSDOT/AUTC Corrosion Research Project

#### 2) Best Practices and Guidelines for Protecting DOT Equipment from the Corrosive Effect of Chemical Deicers



*The objective of this project* is to identify, evaluate and synthesize best practices that can be implemented to minimize the effects of deicer corrosion on winter vehicles and equipment, such as design improvements, maintenance practices, and the use of coatings and corrosion inhibitors. Part of this project will include the development of best practice guidelines and their periodical updates along with laboratory and field research to validate best practices if deemed necessary.



16