Mechanical Reliability & Productivity
Barry Kanuch, Chief Mechanical Officer
Mechanical Overview
Service, Maintain, Repair and Rebuild

As of 12/31/07

- Mechanical Workforce 9,000 +/-
- Locomotives 8,700+
- Freight Car Inventory 300,000+
- Operating Budget $1.6 Billion
- Fuel (Gallons) 1.3 Billion

Locomotive Shops
Car Rebuild Shops
Mechanical Strategy

Conference Topics

- People
- Safety
- Reliability
- Asset Utilization
- Leverage Technology
Improvement Hierarchy

- Process Improvement
- Organizational Effectiveness
- Technology
- “Iron in the Ground”

Impact

$
Our Culture Drives Our Business Safety

Union Pacific Mechanical Employees

Behavior Based Safety Process

- Management Driven
- Employee Engagement
- Cultural Change Commitment / Ownership

- Teamwork
- Shared Goals
- Empowerment

FRA Frequency Rate

1990s

Today
Our People are a Competitive Advantage

- **Hire the Best**
  - Community Colleges
  - Technical Exams
  - College Hires

- **Strong Technical Skills**
  - “Super” Technicians
  - New Training Program

- **Develop Strong Leaders**
  - Supervisor “Degree” Program I & II

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- Strong Technical Know-How
- Tactical Problem Solving Skills
- Day-To-Day Supervisory and Leadership Abilities
- Broad Business Acumen
- General Management Capability
- Strategic Leadership Capability
Locomotive Reliability

Road Failures per Locomotive Year (FLY)

- 2000: 3.71
- 2002: 2.95
- 2004: 2.67
- 2006: 2.31
- 2008 YTD: 2.15
- Future

Life Cycle Cost

Reliability Centered Maintenance (RCM)

- Design
- Build
- Operate
- Modify
- Overhauls
- Maintain
- Retire

$60 MM Savings

Future: 1.00

Good
Locomotive Reliability
*Maintain for Reliability*

- Reliability Centered Maintenance (RCM)
  - Weibull Based Failure Analysis
  - Lifecycle Analysis
  - Reactive to Predictive

![Graph showing Locomotive Engine Life Extension](image)

- Locomotive Age
- Future Predictive Maintenance Events
- Prior Overhaul Point
- New Overhaul Point

2 Overhauls to 1
Asset Utilization

Locomotives Generated from Improved Repair Cycle Time

$150 Million Capital Savings

2006: 21
2007: 41
2008 YTD: 75

2006
2007
2008

2006
2007
2008
Asset Productivity
Refrigerated Box Cars

Improving Fuel Efficiency

- Remote Monitoring
- Remote Start/Stop
- Improved Customer Service
- Reduced Mechanical Inspections
Network Wayside Detection

- 1332 Bearing & Traction Motor Temperature
- 13 Wheel Impact/Hunting/Imbalance/Overload
- 187 Wheel Temperature/2 Braking Performance
- 7 Low Air Hose
- 2 Wheel Profile + Vision (Coupler/Shoe/Wedge)
- 7 Acoustic Bearing
- 1 Ultrasonic Wheel Crack Installation (North Platte)
Freight Car Productivity & Reliability

Training and Technology

Mechanical Caused Main Line Derailments

- Wayside Detection
- Employee Training
- In Train Repairs
Strategic Sourcing – Project OR

*Total Cost of Ownership (TCO)*

- **External Factors**
  - Rising Commodity Prices
  - Increased Demand / Smaller Supplier Base

- **Internal factors**
  - Total Cost of Ownership (TCO)
  - Predictive Maintenance vs. Reactive

- **Supplier Quality and Development**

**Engine Lube Oil ($Millions)**

<table>
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<tr>
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<th>Est. 2008 pre- TCO</th>
<th>Est. 2008 post- TCO</th>
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<tr>
<td>Engine Lube Oil</td>
<td>$58</td>
<td>$51</td>
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-12%
Capital Efficiency

Locomotive Service Pits

- Incremental Capital Investment
- Reduces Locomotive “Out of Service” Days
- Additional Fuel Savings
- 18% Return on Investment from Completed Locations
Locomotive Technology
Reducing Emissions

- Emission Overview
- 21 Hybrid and 163 “Gen Set” Locomotives*
- 830 EPA Tier 2 Locomotives*
- 59% of Fleet EPA Certified*
- Future Regulations

*As of 12/31/07
Freight Car Technology
*Electronically Controlled Pneumatic Brakes (ECP)*

- **Intermodal Pilot**
  - Fall 2008 - Sunset Corridor
  - 10 Locomotives and 2 sets of 125 intermodal cars

- **Items to Evaluate**
  - Fuel and Emission Impact
  - Maintenance Expenses
  - Train Handling/Braking
  - Run Times
  - Train Inspection
  - Train Line Distributed Power
Summary

- Safety
- Employee Engagement
- Workforce Strategy
  - Sourcing/Development
- Reliability/Utilization
- Emissions
- Leverage Technology

Create Value