SEEING MACHINES

Operator Fatigue System

In 2008, Caterpillar®, parent company of Progress Rail, completed a comprehensive study of fatigue detection technology. The result – Caterpillar awarded Seeing Machines Driver Safety System (DSS) the highest rating by fatigue experts for camera-based solutions. Since 2008, DSS has been installed in over 4,000 Cat® mining vehicles and proven to be a vital tool for detecting operator fatigue. In 2014, EMD began working with Seeing Machines, leveraging Caterpillar expertise in the mining industry, to bring the same operator fatigue detection technology to the rail industry.

Product Specifications:

- Latest generation Linux operating system
- Fatigue and distraction monitoring based on eye closure detection, duration and head pose
- Rapid initialization and robust tracking
- Configurable for:
  - Full face or eye only video of detected events
  - Black box functionality
  - In-cab vibration and/or audio alerts
- Rugged industrial grade IP-67 Waterproof Screw type front panel connectors
- 0dB silent operation, no moving parts
- Enhanced hardware control and diagnostics
- Fully customizable configuration parameters to suit different needs

Real-Time Intervention

- 24-hour monitoring center
- Monitoring and classification of all events
- Implementation of customer-specific
- Fatigue Intervention Plan
- Integrated with Intellitrain
- Two-minute response time
- Daily event summary reports
- Proactively monitor system health
- Tier 1 support available 24/7

Continuous Improvement

- Application Programming Interface (API) available for system level data integration
- View event details and download videos
- Windows based OFSi software client
- Web based client for field staff
- Extensive reporting capabilities
- Data exports available in a variety of formats
- Measure and refine Fatigue Management Plan

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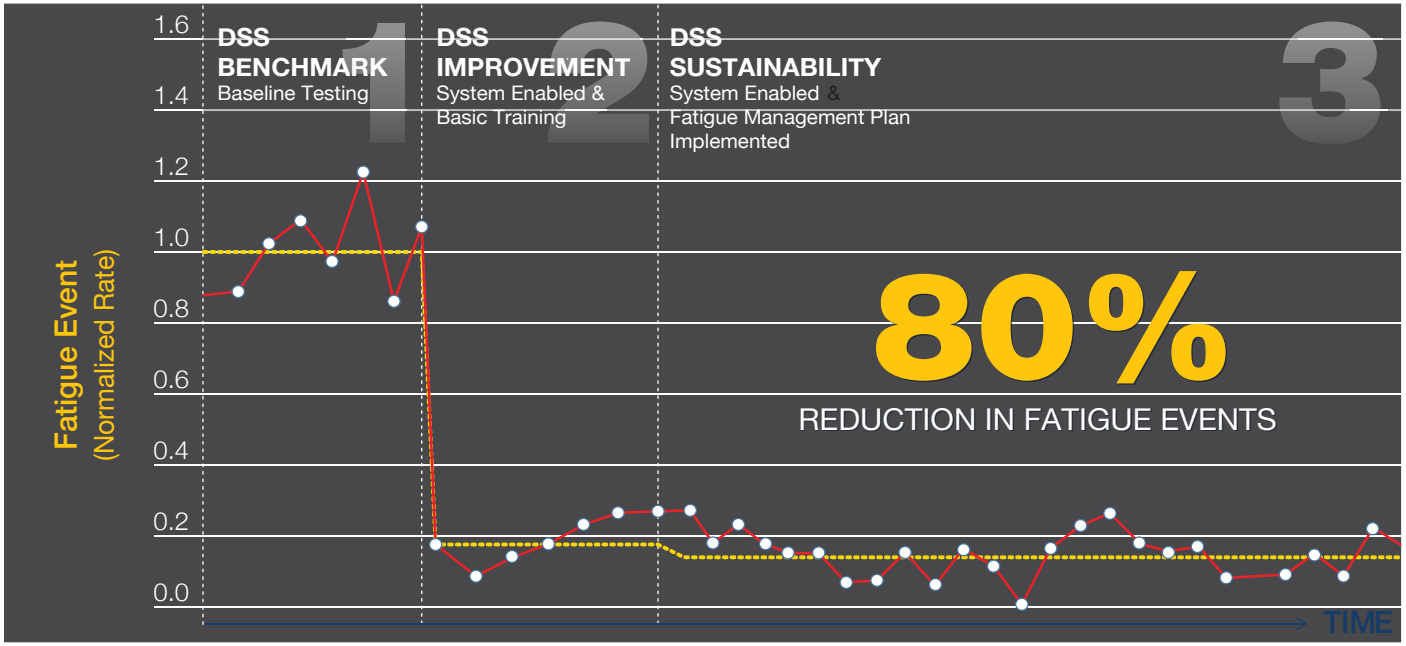
Operator Fatigue Detection System Benefits

Utilizing a three-stage process, the Operator Fatigue Detection System is proven to significantly reduce fatigue and distraction events.



1 Benchmark
Baseline testing involves Operator Fatigue Detection System installation in the operator environment with no intervention.
This allows the current picture to be clearly understood and established.
2 Improvement
Immediate improvement is recorded when Operator Fatigue Detection System is enabled and the operator receives immediate in-cabin feedback (audio alarm + seat vibration) of both fatigue and distraction events.
3 Sustainability
Long-term and sustainable reduction of fatigue events (typically exceeding 80%) occurs when the system is fully enabled and a fatigue management plan is in place.

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