Fatigue Risk in Mining Beyond the Haul Truck

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Executive Summary: The Problem

Fatigue in mining is not limited to the person behind the wheel of a haul truck. Shovel and drill operators, dispatchers, plant and crane operators, maintenance technicians and shift supervisors carry the same shift load, and their mistakes can be just as costly.

Most fatigue programs were built around the haul-truck cab, where a camera can watch the driver's eyes. Many other roles have no such tools. A control-room operator may watch an entire fleet from one chair. A supervisor's fatigue shows up in decisions that affect dozens of other people.

This paper looks at five role groups outside the haul truck, explains why current fatigue systems miss them, and describes how the voice-based fatigue risk system from WISS Technologies can help. It is a prevention approach: it estimates fatigue risk before performance drops.

Shifts, Night Work and the Fatigue Load Beyond the Cab

Twelve-hour shifts and rotating rosters apply to the whole site, not just to drivers. Sleep debt builds across consecutive days, and the final hours of a shift and the end of a roster cycle carry the highest risk.

Night work is the larger problem. It disrupts the body clock, lowers vigilance, and leaves workers with poorer daytime sleep to recover on. Day shifts are better aligned with natural rhythms, but they still carry fatigue from workload and shift length.

Fatigue also shows up differently across these roles:

- **Active, high-hazard roles** (equipment operators, maintenance technicians): slower reactions, missed cues, shortcuts.
- **Monitoring roles** (dispatchers, control rooms, plant operators): attention lapses during long stretches of low stimulation, then a slow response when something changes.
- **Decision roles** (shift supervisors): poorer judgment about risk, rest and whether work should continue.

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Five Role Groups at Risk

Each of these groups has a different fatigue exposure, and each already uses voice as part of normal work.

Role group	Where fatigue shows up	What a lapse can cause	Voice already in the workflow
Shovel, excavator, drill, dozer and grader operators	Long repetitive cycles, night work, reduced attention to surroundings	Contact with vehicles, people or ground conditions nearby	Radio calls with dispatch and spotters
Dispatchers and control-room operators, including remote operations centers	Sustained screen monitoring; one person watching many machines	A missed or late response that affects the whole fleet	Constant radio and phone traffic
Plant and process control-room operators; crane and hoist operators	Monotonous monitoring, night shifts, precise handling	Process upsets, dropped or swung loads	Radio, intercom and shift handovers
Maintenance technicians	Round-the-clock work, time pressure during shutdowns, multi-step procedures	A skipped step, an incorrect repair, an injury	Pre-job briefings, handovers, radio check-ins
Shift supervisors	Decisions made for others, often at the end of long shifts	Tired crews kept working, risks accepted	Radio, briefings and handovers

Why Current Fatigue Systems Miss These Roles

Mining companies use several kinds of fatigue management systems:

- **Wearable devices that track sleep patterns.**
- **In-cab cameras that watch eye closure and head movement.**
- **Biomathematical models that estimate risk from the roster.**
- **Self-reporting tools and fatigue checklists.**

These tools work best for the people they were designed around. Cab cameras don't cover a control room, a workshop or a supervisor's truck, and cameras raise privacy objections where people sit for hours. Wearables depend on workers wearing them. Roster models describe the schedule, not the person. Self-reports are least reliable when someone is already tired.

Detection versus prevention

A deeper gap is the difference between detecting fatigue and preventing it.

- **Detection** finds fatigue after it has affected performance, usually through visible signs such as eye closure or head nodding. By then, risk is already high and the response time es really short to prevent accidents.
- **Prevention** finds early indicators before performance drops, and gives people time to apply preventive protocols to reduce the risk.

For a dispatcher or supervisor, there may be no visible sign at all until a decision has already gone wrong.

Voice-Based Fatigue Prevention with WISS

WISS uses short voice recordings to assess fatigue risk and support preventive action throughout the working shift. Each recording takes approximately 8–15 seconds and can be submitted from a compatible phone, workstation or shared terminal, without dedicated cameras or wearables.

Voice analysis is the core of the system. WISS develops an individual reference from repeated valid samples and combines voice results with sleep history and working hours to provide context for risk assessment. A questionnaire at the beginning of the shift records sleep and shift information; subsequent voice samples allow risk to be reassessed as the shift progresses.

WISS is designed to identify elevated fatigue risk up to five hours ahead, giving supervisors time to consider preventive measures before an incident occurs. This is a risk estimate, rather than a guarantee that an individual will become fatigued within a fixed period.

For mining operations, this approach offers:

- **Coverage beyond the vehicle cab.** Equipment operators, dispatchers, plant personnel, maintenance technicians and supervisors can participate through the same assessment process.
- **Checks that fit operational routines.** Assessments can be scheduled at shift start and at agreed intervals, with additional checks at critical points in the operation.
- **Individual monitoring over time.** Repeated voice samples support assessment against the worker's own reference and provide a record of results during the shift.
- **Information that supports action.** The supervisors' application presents alerts, relevant sleep and shift information, and explanations of questionnaire risk. Supervisors can document the actions taken.
- **Visibility across all the operations.** Dashboards and reports help safety teams review results, alert management and trends across groups and sites.

What the System Does and Does Not Claim

WISS provides decision support for fatigue prevention. Its results should be interpreted within the organization's fatigue management procedures and the worker's operational context.

- **It estimates risk.** WISS supports fitness-for-duty procedures, work planning and supervisor judgment; it does not replace them.
- **Voice and questionnaire results provide distinct information.** Reported sleep and working hours can indicate elevated risk even when a voice result does not. The system can present and manage these findings separately.
- **It is not a medical or substance-use test**. Fatigue results should not be interpreted as a diagnosis or as evidence of drug or alcohol use.
- **An elevated result calls for an agreed response.** Depending on the circumstances, this may include a supervisor conversation, rest, reassessment or a change of task.

Implementation and Governance

Effective implementation requires clear responsibilities, practical response procedures and workforce trust. A focused pilot can establish how WISS fits the site's existing fatigue management program.

- **Define the assessment routine.** Establish when workers complete the initial questionnaire and subsequent voice checks, including arrangements for shared terminals and workers without personal phones.
- **Agree how alerts will be handled.** Assign responsible supervisors, define escalation procedures and document the actions expected when risk is elevated. Notifications support this process; they do not replace active supervision.
- **Protect personal information.** Establish appropriate consent, access, retention and permitted-use arrangements before deployment, involving workforce representatives where necessary.
- **Explain results to workers.** Workers receive their assessment results, while designated supervisors receive the relevant alerts through the configured channels. Explain what each result means and what happens next.
- **Include supervisors as participants.** Supervisors should be covered by the fatigue program as well as responsible for responding to their teams.
- **Evaluate implementation and outcomes.** Review participation, successful assessments, alert response times, documented actions and worker feedback. Consider incident and near-miss trends without attributing changes to the system alone.

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Conclusions

Fatigue management in mining must extend beyond haul-truck operators. Dispatchers, plant and crane operators, maintenance personnel and supervisors also perform demanding work across long hours and night shifts.

WISS provides a practical way to extend assessment across these roles. Short voice recordings, supported by sleep and shift information, enable repeated risk checks without requiring dedicated cameras or wearables. Supervisor tools, alerts and management reports connect those assessments to the operational response.

The value lies in combining early risk information with timely, documented action. Used within a structured fatigue management program, WISS can help mining organizations broaden workforce coverage and strengthen their prevention procedures.

To discuss a site pilot, contact WISS Technologies at **www.wisstechnology.com.**

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