FATIGUE MANAGEMENT CASE STUDY

90 DAYS TO 94% FEWER FATIGUE EVENTS

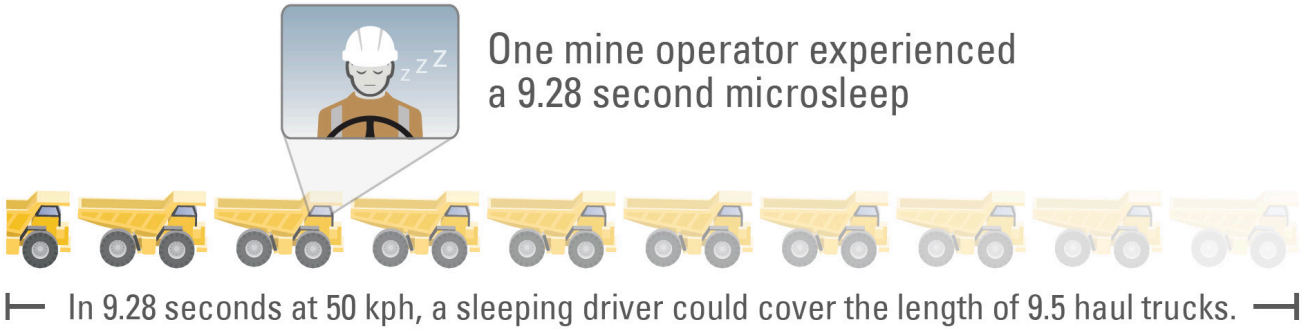
VISIBILITY TO FATIGUE RISK ACCELERATED CULTURE CHANGE AT AN AUSTRALIAN MINE.

Count to nine. One-one-thousand, two-one-thousand, three . . .

Now close your eyes and count again, this time imagining you are driving a 400-tonne haul truck fully loaded with coal, moving at 50 kph. One-one-thousand, two-one-thousand, three . . .

You are a drowsy operator on the home stretch of 12-hour shift, fighting monotony and biology to power through an invisible force as weighty as gravity. At this point your brain has difficulty objectively assessing how fatigued you are. Even if you catch yourself nodding off you would never tell anyone. You have a job to do, and it's just a couple hours until quitting time.

ASLEEP AT THE WHEEL
Most microsleep events last 2-20 seconds



What could have happened in those 9 seconds you were asleep at the wheel? Damage. Destruction. Death?

That scenario wasn't just a frightening hypothetical for a mine site in Australia. It was an actual incident captured when the company started seeing fatigue in action. The fatigue threat was starkly visible, and this event was just one of many on the job site that day.

UNCOVERING THE UNSPOKEN

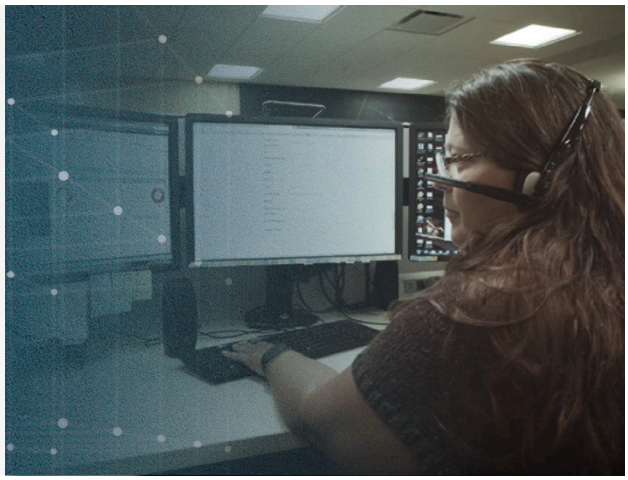
One of the most dangerous aspects of fatigue is that it's very difficult to self-diagnose. By the time an operator realizes fatigue is bearing down, multiple microsleeps – brief sleep events – have likely already happened. Microsleeps often occur unbeknownst to the operator, and usually go undetected by anyone else on the job site. Our mining customer took its fatigue management journey to the next level by using the Cat® Driver Safety System (DSS) to see how prevalent microsleeps were throughout its operations.

The DSS alerts operators the instant they drift off at the wheel for 1.5 seconds or more. It also makes a weary operator's condition visible to someone else – a safety advisor in the Caterpillar 24/7 Fatigue Monitoring Centre – who can notify a supervisor on site that the operator is at risk.

Initially, this customer installed DSS units in four long-haul trucks to establish baseline data. Over the first 40 days, a staggering 157 sleep events occurred. It wasn't just one operator nodding off each day; it was multiple operators every day. Collectively during that 40-day period, operators travelled more than a quarter of a kilometer while sleeping. But that wasn't the whole story.

The DSS uses facial recognition technology to detect physiological signs of fatigue, and then alerts the operator if a microsleep occurs while the machine is travelling at least 1.5 kph.

Safety Advisors in the Caterpillar 24/7 Fatigue Monitoring Centre review clips that show the operator during a DSS activation. The DSS camera does not record continuously, only the four seconds before, during and after the alert.



OVER THE FIRST 40 DAYS A STAGGERING 157 SLEEP EVENTS OCCURRED.

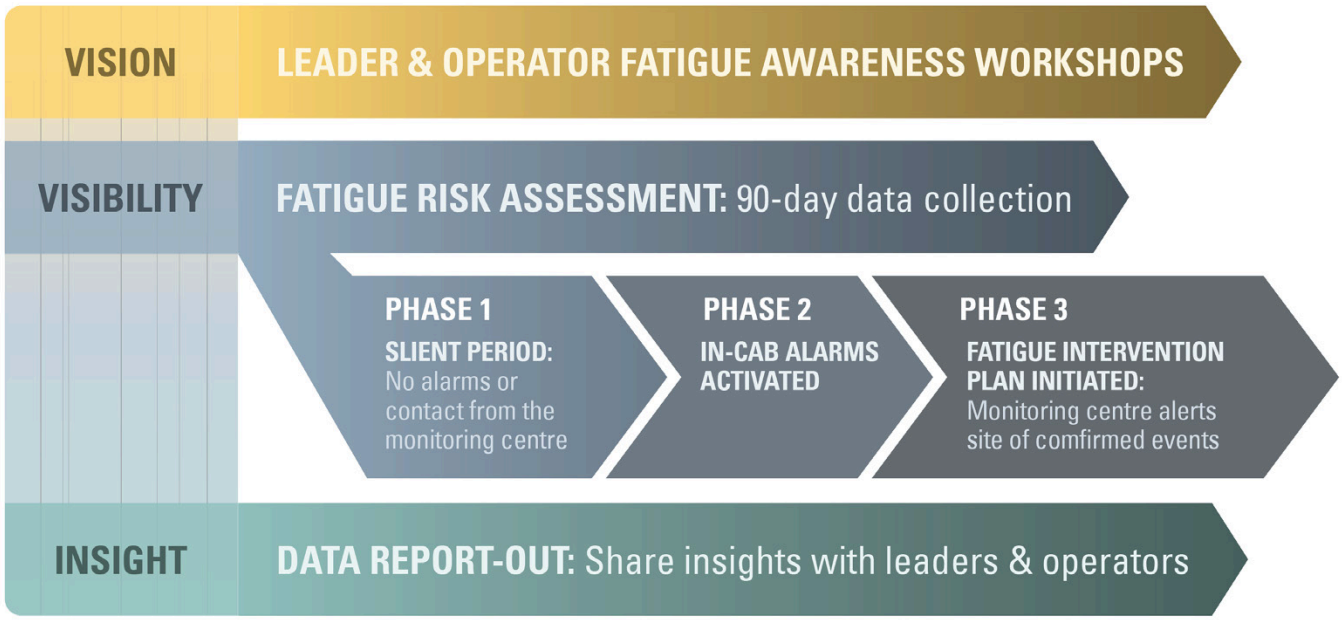
"157 microsleeps in four trucks meant we potentially had more than 900 microsleeps across our operation during that time," said the company's Health and Safety Manager. "If you think fatigue isn't occurring on your site because you don't hear about it, you're wrong."

Mitigating an incident in the moment of greatest vulnerability is a vital first step to managing fatigue risk, but systematically reducing incidents over time requires more than technology.

SEEING IS BELIEVING

The Fatigue Risk Assessment (FRA) allowed our customer to see fatigue in action, and it also provided insight into an intangible influencer of risk, something that the DSS alone couldn't fix – the company culture.

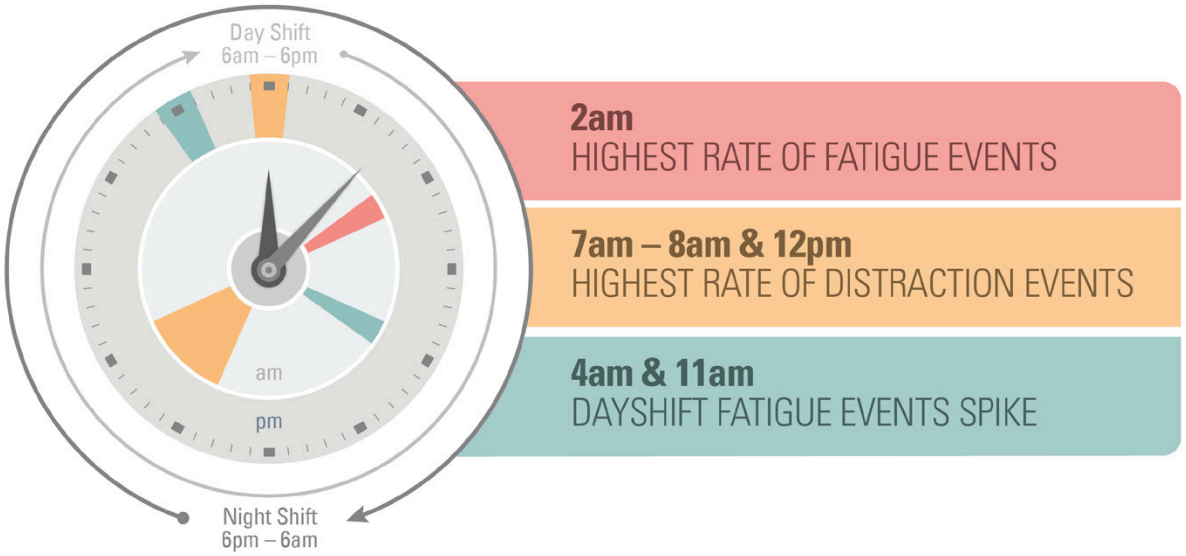
Fatigue Risk Assessment



In an industry that prides itself on grit and fortitude, on a job site where the "best" operators were the ones who got the most done, few people – maybe none – were willing to say "I'm too tired to do this safely."

Leaders at the mining company weren't surprised when the DSS confirmed fatigue events were happening, but the prevalence was alarming. What concerned management was the culture of denial among shift workers that microsleeps were occurring so frequently.

90-Day Data Collection Revealed Points of Highest Risk



ONE OPERATOR FELL ASLEEP 40 TIMES DURING A 4-HOUR PERIOD.

"In Phase 2, when we activated the alarms, we consistently saw operators being alerted two, three or more times, but never pulling off to take a break or let someone know they were fatigued," the company's Health and Safety Manager said. "They either thought they could safely continue, or they feared disciplinary action for falling asleep."

Both options in that either/or conclusion are dangerous. The first could be optimism bias, the feeling that "it won't happen to me." More than 80% of people in at-risk circumstances feel unrealistically secure. Indeed, the company's operators had been successfully resisting the clutches of fatigue for years, but not because they were invincible. They were just extremely lucky.

Overcoming optimism bias and convincing operators that self-reporting fatigue would not result in discipline or dismissal wouldn't happen without behavior change – by management.

MORE TALK, MORE ACTION

It started with talking. Historically, fatigue was a topic so inherent in the mining lifestyle that it didn't seem worthy of mention, but it became the first item on the agenda of every return-to-work meeting. Operators realised management was serious about the risk because they talked about it so frequently.

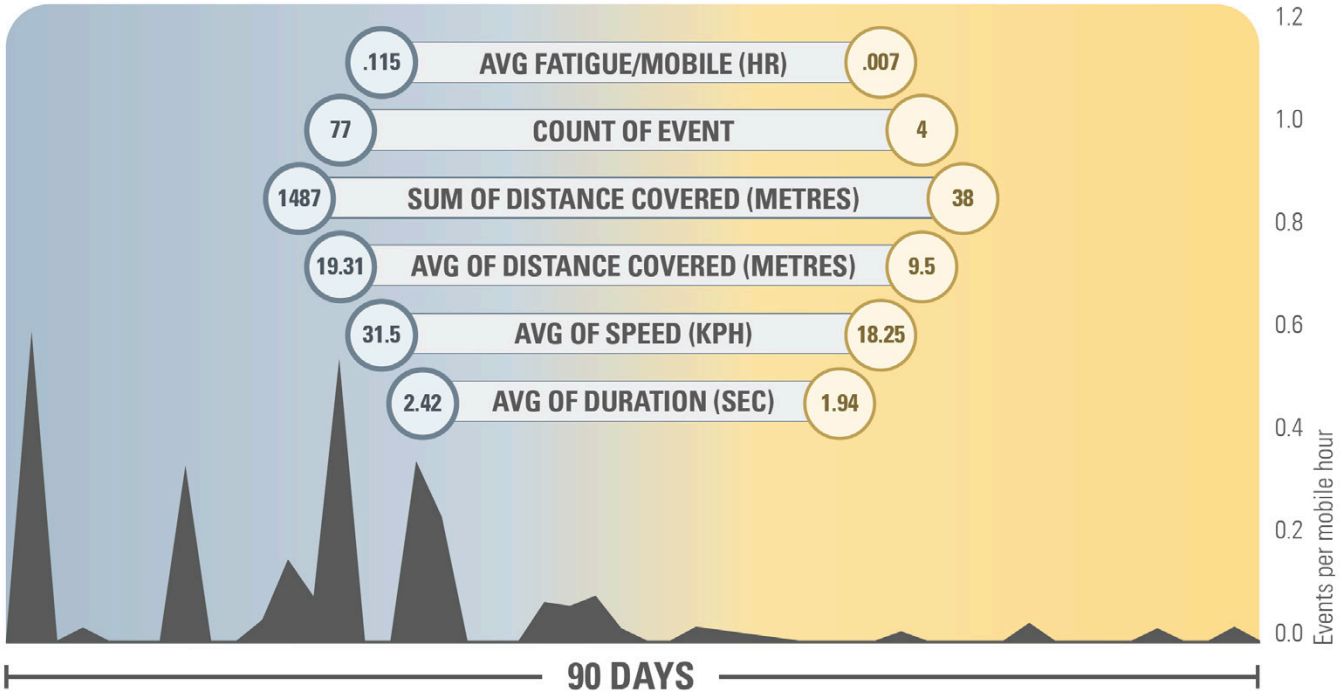
A comprehensive approach to risk reduction began in Phase 3 of the Fatigue Risk Assessment, when a Fatigue Intervention Plan (FIP) was initiated. The FIP is the protocol for what happens when a sleep event occurs – a critical moment for management to back up well-meaning words with sincere action. The FIP is also critical to ongoing fatigue management. Without the prescribed intervention steps, coaching and support that derive from the plan, the DSS can become just another alarm in the cab, white noise that operators eventually ignore.

This company's FIP is non-punitive. A supervisor contacts the operator, the two together use a checklist to identify the factors that caused fatigue, and then they agree on next steps. The operator either returns to work after a short refresher break, moves to lower-risk or manual duty, or in severe cases may be driven back to camp for rest.

Case-by-case response measures and the conversations they produce keep operators from becoming complacent and relying on the DSS to wake them if fatigue strikes.

After implementing its FIP for 30 days, our customer concluded the risk assessment with an astonishing 94% reduction in fatigue events.

Data Collected During 90-Day Fatigue Risk Assessment



SUSTAINING A CULTURE OF CARE

Imparting basic science and debunking persistent myths about sleep and fatigue empowers operators to personally manage risk. All operators learn strategies for optimising sleep, managing alertness and detecting early signs of fatigue.

"Fatigue doesn't discriminate," the company's health and safety manager shared. "We're all humans and shiftwork flips our natural clock upside down for seven-day stretches. Fatigue will happen, but it doesn't have to result in injury."

Though fatigue impacts everyone, it is experienced differently by each person. A greater emphasis on personal awareness, frequent encouragement to speak up when fatigue sets in, and positive recognition bestowed upon operators who report fatigue impairment have contributed to a continuous reduction in fatigue events. If an ongoing fatigue issue is discovered, management helps the employee develop a personalized fatigue management plan. The site now experiences an average of less than one sleep event per day, down from more than 16 when data collection began.

Managing fatigue risk has also given the company a business advantage. In the case of this company, visible efforts to proactively manage fatigue risk helped them renew a contract with a longtime customer.

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