

DO YOUR ROSTERS MINIMISE FATIGUE?

Fatigue and working hours are one of Resources Safety's top ten priorities for the mines inspectorate, and are typically at the top of the list when roadshow participants are asked what they would like to hear more about. Here Jim Huemmer of Shiftwork Solutions discusses how rosters and actual hours of work can be tailored to an organisation's needs and its workforce while minimising fatigue.

Jim has over 23 years' experience in optimising rosters, sleep and safety, and a large part of his career has been dedicated to working with shift workers and improving health, alertness and safety. His article is based on information collected from over 23,000 shift workers.

Optimal work rosters have a tough assignment. They need to satisfy three key requirements for any organisation or work area:

- business needs (e.g. workload changes, 24/7 coverage, costs)
- worker desires (e.g. pay, time off, work/life balance)
- health and safety requirements (e.g. wellbeing, alertness, workplace safety).

Although sometimes these needs compete, minimising workplace fatigue can benefit all three areas. Minimising fatigue improves business performance and worker satisfaction and reduces the risks of safety-related incidents.

While factors such as age, health, diet and lifestyle choices are important for safety, these factors are ultimately not ones that organisations and managers can control. However, rosters and actual hours of work can be tailored to an organisation's needs and its workforce.

Opportunities for sleep, the hours of work (per day and per work cycle), shift rotations, breaks between shifts and work cycles, and worker commutes need to be evaluated when trying to minimise fatigue.

Workers do not require the same amount of sleep to be fully alert the next day. Many individuals require seven to eight hours to be fully alert, while others require more hours of sleep and some can get by with less. Similarly, not everyone copes with shift work and changes to their sleep-and-wake patterns the same way.

SO HOW DO YOU KNOW IF YOUR ROSTERS ARE MINIMISING FATIGUE?

You need to obtain information from the work site. Useful measurements for evaluating fatigue include information on hours of work, leave usage or patterns, production volumes, safety statistics, quality measures and employee feedback.

If your mining workers are averaging 5.9 hours of sleep when working on night shift, would you be concerned or think that this amount could be improved? What if they are averaging 5.9 hours of sleep when working on day shift, would you think that this amount is a problem?

To better understand the relationships between fatigue, sleep and hours of work, information has been obtained directly from over 23,000 shift workers. Gathering information about sleep quantity, sleep quality, caffeine usage, health habits, worker commutes and other site-specific parameters provides a comparative tool for measuring how well workers are coping with their current arrangements.

The industry benchmarks for the sleep patterns of individuals working 12-hour shift rosters are shown in Figure 1 and show that workers typically accumulate sleep debt while working day and night shift assignments compared to their days off. Returning to the earlier questions, we can see that achieving 5.9 hours of sleep on average on night shift is quite common, but achieving 5.9 hours of sleep on average on day shift is not.

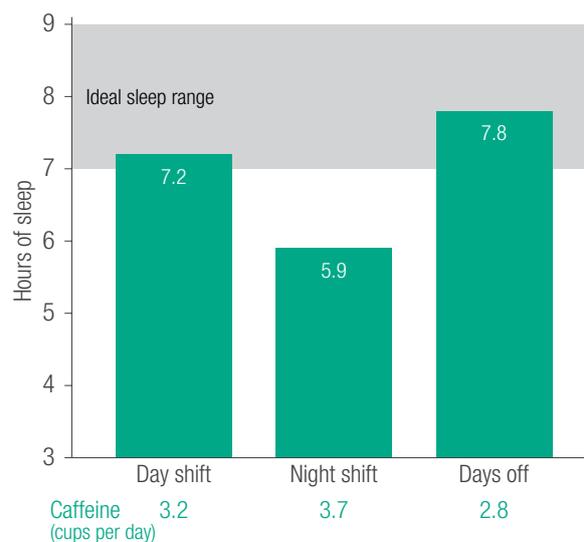


Figure 1 Graph showing average hours of sleep obtained and average daily coffee consumption for various work arrangements for 23,000 shift workers

Our experience with mine workers shows that most individuals short change themselves of sleep on days that they work and then try to catch up on their sleep on days off. It is this accumulation of sleep debt or sleep loss during work cycles that creates fatigue.

Information obtained directly from workers provides insight for evaluating how many shifts in a row is optimal for this type of work and managing fatigue. It also shows that individuals typically obtain 18 per cent less sleep when working night shift assignments compared to day shift.

Caffeine usage by mine workers can raise their alertness (in the short term) and this usage is also an indicator of fatigue. As shown in Figure 1, caffeine usage (measured as cups of coffee) is typically inversely proportional to the amount of sleep obtained by individuals (i.e. the less sleep obtained, the higher the caffeine usage).

MINING CASE STUDY

Responding to worker interest in 12-hour shifts, an Australian residential mine (Mine X) changed rosters from 8-hour to 12-hour shifts. To measure the impact of these changes on workplace fatigue, we obtained information from those working the new roster. Figure 2 shows the sleep quantity by shift and on days off.

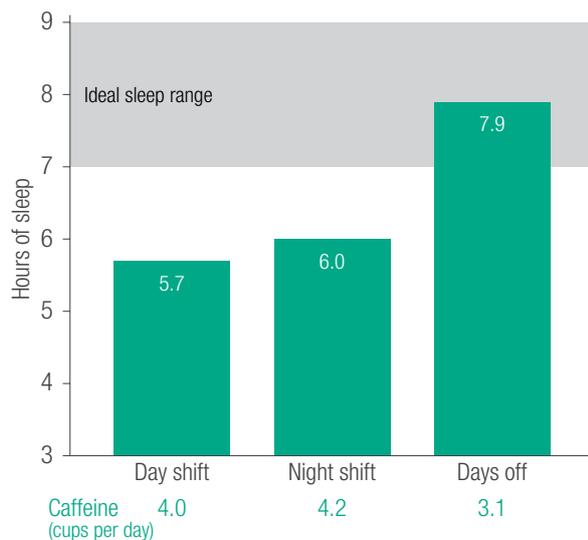


Figure 2 Graph showing average hours of sleep obtained and average daily coffee consumption for various work arrangements for workers at Mine X

Worker feedback suggests that this roster change does not minimise fatigue. Although there is a slight increase in sleep obtained during night shift assignments (0.1 hour) and on days off (0.1 hour) compared to industry norms, this benefit does not outweigh the significant loss of sleep that occurs on day shift assignments (1.5 hours). Caffeine usage on this roster also exceeds industry norms by over 16 per cent as workers try to cope with their new hours of work.

Other data acquired from Mine X supported conclusions that fatigue had actually increased as a result of these roster changes. Interestingly, these trends were not identified through the safety statistics from site (safety performance showed no change), but were primarily identified from production volume data. We found that fatigued workers at this mine site tended to pace themselves through their 12-hour shifts rather than take any additional safety risks.

In the end, it was an adjustment in shift start and finish times for the 12-hour shift roster that improved alertness for workers on site.

Key strategies for achieving acceptable levels of risk in the workplace include:

- identifying the optimal roster design (planned hours of work) for your site or work area
- worker education about sleep and fatigue
- managing actual hours of work.

WHERE ARE WE HEADING?

Mining rosters, hours of work and worker conditions have changed significantly in the last two decades. It was only twenty years ago that most rosters were residential based and not drive in, drive out (DIDO) or fly in, fly out (FIFO), and shifts were eight hours long.

Previously, mine workers typically moved to remote locations and lived there with their families and friends, contract mining was not widely used in the industry, and most mine sites had one roster for the entire site covering production, maintenance and processing.

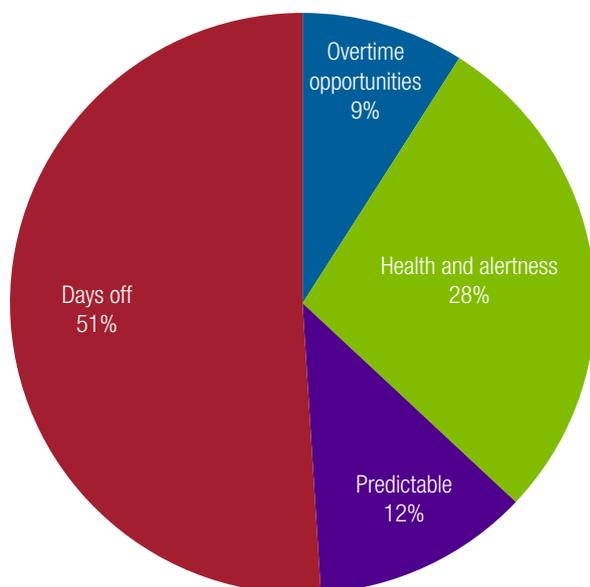
Today, when we ask workers to identify their single most desired improvement, most are interested in better health and alertness. Twenty years ago, most were interested in better days off. Figure 3 illustrates this change in worker sentiment.

The use of 12-hour shifts in mining operations that has occurred in the last twenty years appears to be driven more by worker interests (for time off) than by business interests. Yet profiles of mine workers indicate that they are less satisfied with their current rosters and hours of work than workers from other industries. Mine workers also prefer higher average hours of work per week and longer shift lengths than workers in other industries.

Each mine site is different and offers a unique set of circumstances or challenges for minimising fatigue. Areas of interest for sites trying to minimise fatigue-related risks should include a detailed understanding or analysis of:

- the lengths of work cycles and periods of time off
- hours of wakefulness between shifts and during first and last shifts in work cycles
- the use of long distance commute rosters in residential-based situations
- the amount of time off when rotating from night to day shift assignments
- hours of work for supervisors and team leaders
- managed camp environments and culture
- different travel and transport options to and from site.

Perspective in 1994



Perspective today

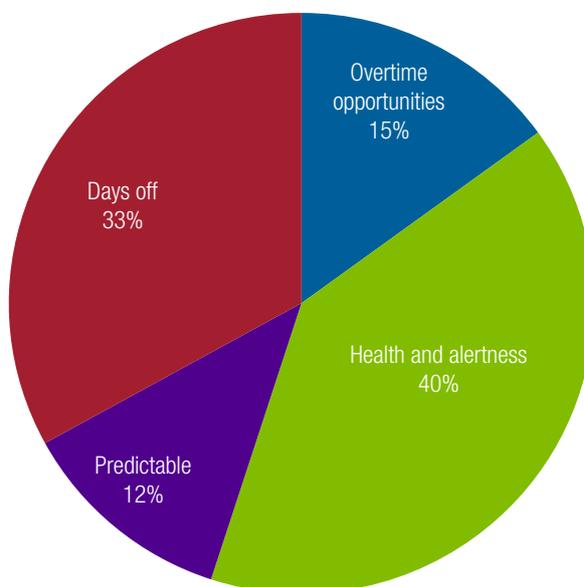


Figure 3 Pie charts showing change in worker sentiment regarding most desired improvement to their working lives

NSW'S TRAINING PACKAGE FOR FATIGUE RISK MANAGEMENT



New South Wales recently added an evaluation manual to its excellent fatigue management plan guide and suite of tools to enable industry to deliver their own fatigue management workshops. Although tailored to meet the mining and extractives industry's obligations under that State's occupational health and safety legislation, these resources may be useful for Western Australian operators.

The *Fatigue Management Evaluation Manual* provides mines with guidance on evaluating their fatigue management in-house. The goal is to establish a mine's capacity, culture and approach to managing fatigue.

The manual is structured like an audit but aims to gauge an organisation's systematic capacity and cultural readiness or maturity. It is easy to use, with a clear four-step approach, and includes all the tools necessary to complete the evaluation.

Visit www.resources.nsw.gov.au/safety/world-leading-ohs/fatigue for further information.