



Wake up to fatigue risk management!

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Abstract

There have been several high-profile accidents in industry where fatigue was identified as either causal or contributory. The risk of fatigue is inherent in any work-time arrangement involving shift work, long hours of work, irregular hours, extended work hours, and work that is physically or mentally demanding, repetitive or requires high vigilance.

The management of fatigue is not simply a matter of correct shift scheduling - a more comprehensive approach is needed. In order to be successful, a fatigue management programme should address the unique needs of the operation in which it will be implemented, it should be integrated into the normal operations, and it should encourage active participation from all stakeholders. A fatigue management programme should address task- as well as worker-related factors associated with worker fatigue. This paper will discuss the framework of such a programme.

1. Introduction

The growth of the global economy and advances in technology seem to have expanded the number of jobs that operate outside the boundaries of the normal work day. "24/7" operations, and long and unusual working hours in many instances create the need for staff to work when their bodies tell them they should be sleeping.

Over the last number of years, increasing attention has been paid to fatigue management in industry due to the recognition that sleepiness and fatigue are becoming endemic in the worker population, contributing to human error, and consequently to many (sometimes catastrophic) accidents.

2. Definition of fatigue

It is difficult to find an all-embracing and universally accepted definition of fatigue.

Fatigue can be defined as "a state of impaired mental and/or physical performance and lowered alertness arising as a result or combination of hard physical and mental work, health and psycho-social factors or inadequate restorative sleep. Fatigue can be either work or non-work related or a combination of both" (BHP Billiton, 2005).

Fatigue can also be defined as "increasing difficulty in performing physical or mental activities. Signs of fatigue include tiredness even after sleep, psychological disturbances, loss of energy and inability to concentrate. Fatigue can lead to incidents because workers are not alert and are less able to respond to changing circumstances.

Apart from these immediate problems, fatigue can also lead to long-term health problems" (Shaw, 2003).

Another definition describes fatigue as "the loss of alertness and performance that results from insufficient or poor quality sleep or engaging in mentally or physically demanding activities" (Simpson, 2008).

Other definitions exist, but the above usefully include the concept that fatigue is not simply 'tiredness' and that it has a direct effect on alertness and work performance.

3. Causes of fatigue

Total worker fatigue is the sum total of fatigue related to work-time arrangements, fatigue related to work and environmental factors, and fatigue

related to the operator's personal factors as depicted in the model below:

$$F_T = F_{SS} + F_{ew} + F_{pf}$$

Where

F_T = Total operator fatigue;

F_{SS} = Fatigue related to shift system design (working arrangements, circadian rhythm);

F_{ew} = Fatigue related to work and environmental factors (task requirements, physical work loads, workstation design, physical factors); and

F_{pf} = Fatigue related to the operator's personal factors (health status, nutritional status, social and domestic dictates).

While the above model is not claimed to be a complete representation of all the factors that contribute to fatigue, it points towards a need for a broad and holistic approach to manage this issue.

4. Effects of fatigue

Fatigue has an adverse effect on every aspect of human performance. High levels of fatigue cause reduced performance and productivity in the workplace, and increase the risk of accidents and injuries occurring. Fatigue affects the ability to think clearly, which is vital when making safety-related decisions and judgements. People who are fatigued are unable to gauge their own level of impairment. As a result, fatigued people are unaware that they are not functioning as well or as safely as they would be if they were not fatigued.

Fatigue can also result in long-term health problems such as digestive problems, heart disease, anxiety and depression. Women's reproductive health can also be affected by fatigue. Fatigue and irregular sleep patterns have been associated with a number of negative effects on pregnant women. Negative effects include an increased risk of



miscarriage, low birth weight and a higher occurrence of premature births.

5. Fatigue management

The management of fatigue is not simply a matter of correct shift scheduling: a more comprehensive approach is needed. Ideally a fatigue management programme should address the unique needs of the operation in which it is to be implemented. It should be integrated into the normal operations, and it should encourage active participation from all stakeholders (Schutte, 2008).

The management of fatigue is a shared responsibility between the organisation and its employees. It is, therefore, necessary to develop a culture in the organisation in which everyone accepts that fatigue is a barrier to excellence in safe production and wellness, and that everybody needs to work together to overcome this barrier. The effective management of fatigue depends on the management of the organisation's culture and on the promotion of self-management rather than on technological solutions. In view of the above it is important that a comprehensive approach be taken to address the issue of fatigue.

The model below provides a framework for managing fatigue since it addresses the factors that cause fatigue.

In general, the goal of a fatigue management plan is to maintain and, where possible, enhance safety, performance and productivity in operational settings, and manage the risk of fatigue in the workplace.

The recommended process of developing and maintaining a successful

fatigue management plan consists of five interrelated elements:

- Securing and maintaining senior management commitment
- Developing policy and programme
- Managing fatigue
- Communicating the policy and fatigue management plan
- Monitoring, reviewing and modifying.

In order to make the fatigue management programme as practical and comprehensive as possible (BHP Billiton, 2005), emphasis needs to be placed on:

- Structure and design of work-time arrangements;
- Ergonomics design of workplaces and tasks;
- Employee fitness for work;
- Management processes for monitoring and controlling a worker's potential for fatigue;
- Fatigue-related education and information, and
- Employee assistance programmes.

6. Measurement of effectiveness of fatigue management

Management is a process, not a goal. To effectively manage any programme, ongoing monitoring, evaluation and adjustment are required. The need to measure and maintain holds true for fatigue management. Ongoing evaluation is necessary to determine whether a programme is remaining effective and relevant.

Ideally, the measurement of the effectiveness of fatigue management should strike an appropriate balance between leading indicators and outcome

measures. Examples of leading indicators are the number of individuals diagnosed with and treated for sleeping disorders, and the number of individuals who self-report fatigue when at work. Outcomes involve the usual measures such as incident and accident rates, equipment damage, and feedback from employees.

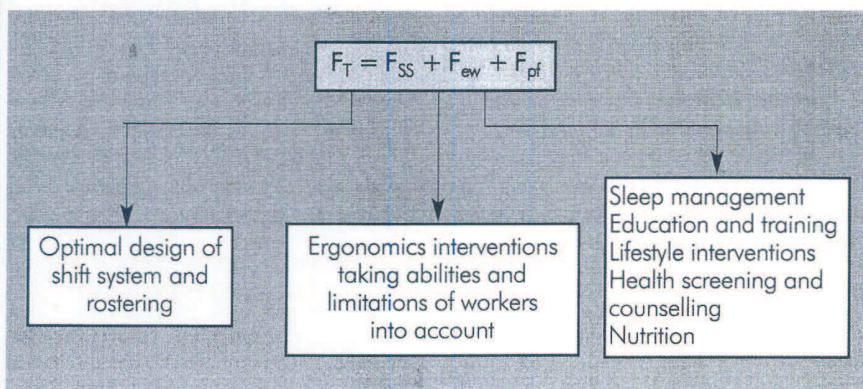
7. Conclusions

Fatigue is a complex state characterised by a lack of alertness and reduced mental and physical performance, often accompanied by drowsiness. It is associated with spending long hours awake, an inadequate amount of sleep over an extended period or obtaining an insufficient quality of sleep, high physical and mental loads, and a number of non-work-related factors.

From a practical viewpoint it is doubtful whether fatigue in the workplace can be eliminated altogether, but it can certainly be controlled: fatigue can be limited by proper management. The management of fatigue is a shared responsibility between the organisation and its employees and all stakeholders should participate in order to provide the safest and healthiest working environment possible. To achieve this objective a holistic approach, based on best practices, is required.

8. References

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Framework for managing fatigue