

Human Element Issues KPI-HEI-45-2014 **(Connection between Fatigue & Stress)**

► Introduction:

Fatigue is a normal human response to normal human activity. Similarly, sleep is a normal human response to tiredness. The daily cycle of work/fatigue/sleep is a normal, healthy part of human life. As people pass through this cycle, their level of arousal fluctuates, this in turn helps to determine how alert they can be to their surroundings.

When people are faced with very few demands, their arousal levels tend to be very low. As a result, their alertness suffers, and they will often feel bored and tired.

As the demands around them increase, people become more aroused in order

► The causes of stress:

Stress can be caused by a large number of factors. Some of these factors are work-related while others may belong to the private lives of the person affected.

Seafarers are particularly vulnerable to both sources since their work brings them into contact with many known work-related stressors as well as removing them from their home lives and countries for long periods. It is important to realise that all the sources of stress in a person's life tend to add together. For example, a moderate source of stress onboard – such as pain from a muscle injury – can combine with personal worries about marital or financial difficulties to produce severe stress reactions that can mystify fellow

to cope with them. Their alertness levels increase and, unless they are suffering from a severe sleep debt, their feelings of fatigue can disappear.

The problem comes if demands go on increasing. Stress is produced when the demands on people (perceived or real) consistently exceed their ability to meet them. Stress produces a complicated series of changes in the body's hormone levels and blood chemistry. Over a prolonged period, this can result in a wide range of adverse physical and behavioural changes in people as well as increased vulnerability to illness. While stress is a common part of human life, it is not the same as arousal, and is always bad. crew members or take them by surprise.

► The signs and symptoms of stress:

Stress is a physiological response to prolonged situations where the demand on people exceeds their available resources. It is always bad and produces both physical and behavioural signs and symptoms.

The Physical signs:

- Headaches
- Skin problems
- Indigestion, upset stomach, ulcers and other digestive problems
- High blood pressure
- Strokes
- Heart disease.

The Behavioural signs:

- Skipping or rushing meals
- Rushing around, making little time for relaxation
- Insomnia
- Changes in mood or behaviour
- Deteriorating relationships with colleagues
- Irritability
- Indecisiveness
- Fuzzy thinking and forgetfulness
- Absenteeism
- Smoking or drinking more than usual
- Indications of drug abuse
- Increased complaints about health
- Complaints about feeling constantly tired.

One of the first signs of chronic stress is difficulty in sleeping, which can then contribute to the development of sleep debt. The inability of people to repay their sleep debt through stress-induced insomnia can itself become a source of stress. This creates a particularly vicious circle in which stress increases sleep debt which increases stress level, with the result that performance levels decline ever faster.

So, normal fatigue is not stress. However, the inability to deal effectively with fatigue can become a source of stress, as can the sleep debt that results. In addition, stress can increase fatigue by stimulating too much production of adrenalin – the source of the human ‘fight or flight’ reaction.

► Common sources of seafarer stress:

The following stressors commonly affect seafarers:

- Watch patterns or other demands that create, maintain or increase sleep debt,

e.g. prolonged six on/six off duty demands during rest periods, and long hours due to reduced manning;

- Too much to do and long hours due to chronically high workload levels;
- Tasks unnecessarily difficult due to chronically adverse levels of lighting, noise, vibration, motion, temperature and humidity;
- Health worries about contact with dangerous cargos and materials, e.g. pollutants, detergents, solvents and oils;
- Gales and bad weather – generally because they disrupt sleep, but also because of joint soreness caused by bracing;
- Employment worries about changes to the industry, e.g. reduced manning policies, increased rules, criminalisation possibilities;
- Social isolation and loneliness due to non-communication between crews of mixed cultures; also to loss of contact with friends back home while at sea;
- Separation worries due to inability to stay fully involved with home and family for long periods; particularly stressful at times of family illness, death or other trauma;
- Home leave worries due to disruption to family household, role awkwardness, sudden lack of structure, different sleep patterns, changes in children; stress of a seafarer at home is similar to employment redundancy, with same feelings of loss of masculinity and role.

► Collective points to ponder:

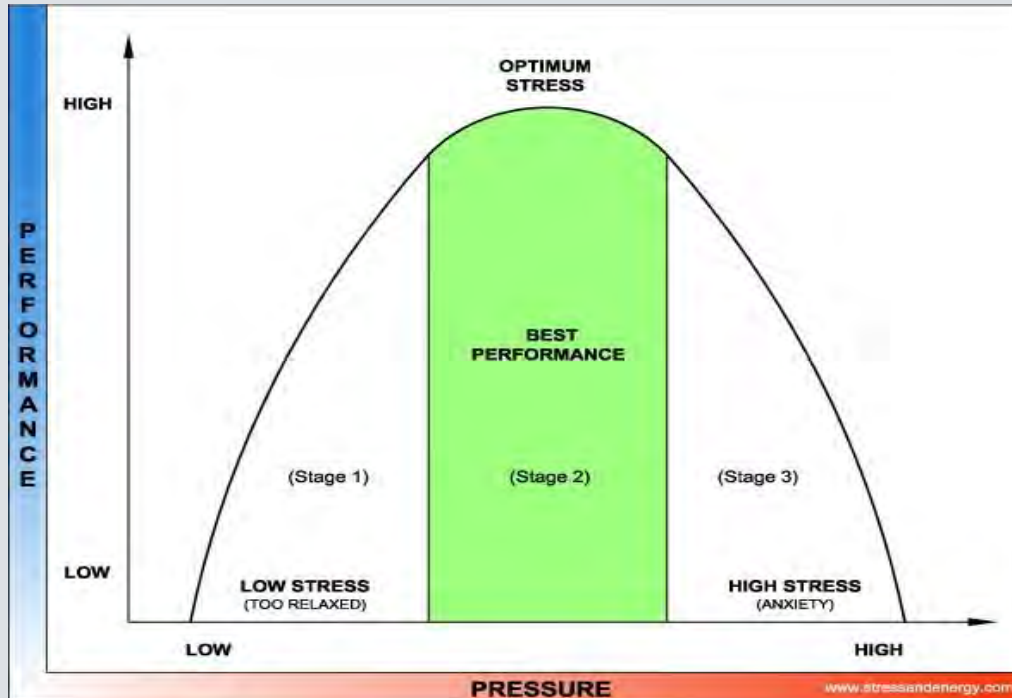
- ❖ Fatigue is an inevitable and normal human response to wakeful activity. The onset of fatigue is affected by workload,

perceived risk, diet, fitness, the time of day and environmental factors such as light, noise, vibration, temperature and motion.

- ❖ The only treatment for fatigue is sleep. Sleep needs to last sufficiently long to include several periods of deep sleep and REM (dream) sleep. If not, we build up a 'sleep debt' which causes us to misread situations, overlook key information and fall asleep even when we know it will put us and our colleagues in extreme danger.
- ❖ Many lessons were learned about the role of fatigue and sleep debt in ship and environmental safety from the 1989 Exxon Valdez disaster. However, the same organisational mistakes continue to be made to the present day throughout the industry.
- ❖ Sleep debt is caused by disruptions to sleep itself – such as loud noise, bright lights, temperature extremes and motion; and by disruption to people's natural daily rhythms. Both causes are especially prevalent in the lives of seafarers, who are unique amongst the safety critical professions. They must spend long, continuous periods of time

working, resting and recuperating inside a designed environment whose prime function is to survive a dangerous natural environment over which people have little control.

- ❖ Design should play a big part in assisting seafarers in the essential task of restorative sleep. However, to do so requires designers to go beyond the limits for lighting, noise, vibration (etc) that must be observed to prevent harm, and pay attention to the lower limits that are relevant to sleep and rest.
- ❖ Operationally, there are many other things that can be done to address fatigue and avoid sleep debt. Principal among these is the use and support of an effective fatigue management plan. However, the success of such a plan involves all levels of the organisation, and the cooperation of many other parts of the shipping industry – Masters and crews, ship-owners and managers, regulators and inspectors. For example, it is entirely counter-productive to shipping safety if port inspections require the attention of fatigued ships' crews during their rest periods.



- ❖ Similarly, the explicit expectation by boardrooms that their crews observe the hours of work and rest laid down by the regulations must be matched by operational policies that allow them to actually be observed. If there is a policy mismatch, the course of least resistance will be human behaviour that the organisation least wants.
- ❖ Examples are falsified duty logs, people who go to sleep on watch without anyone else around to notice, and fatigue-based accident statistics that do not improve.
- ❖ Stress is a normal human response to a bad human situation. It leads to damaging physiological changes and occurs when the demands on people consistently exceed their capabilities. Stressors such as constant noise and vibration, domestic, personal and
 - ❖ Employment worries, social isolation and loneliness can contribute to sleep debt, which turns fatigue itself into a source of stress.
 - ❖ Strategically, stress can be addressed by sensitive, human-centred design of ships, their spaces and their materials.
 - ❖ Operationally, stress can be addressed best by timely communications between those affected, their families and their managers. To do this requires an appropriate organisational culture founded on openness, reporting and learning. Above all, it requires an empathetic culture based on an organisation realising that its profits depend on its safety. And since its safety is created by people who are free from fatigue and stress, reducing these to acceptable levels is an effective investment in its own future.

► **Advice:**

- ✓ DO insist on a fatigue management plan that is endorsed from the management downwards. Your company may need to liaise with regulatory bodies, such as port authorities and your Classification Society, in order to ensure their procedures mesh with yours.
- ✓ DO insist on a review of all other operational procedures in conjunction with your fatigue management plan. You need to ensure that the policies are in harmony with each other. If they are not, your organisation will get behaviour that is too narrowly focused on local problems rather than aimed at averting future problems by reference to the bigger picture.
- ✓ DO take sleep debt seriously. The Australian Government found that the decrease in performance of someone who has been awake for 24 hours is equivalent to that associated with a blood alcohol level 25% more than the current legal UK limit. This makes them seven times more likely to have an accident. Sleep debt develops if people get insufficient deep sleep, which requires them to sleep for 7-8 hours in every 24. If watch systems do not permit this, fatigue can be managed to some extent by diet, physical environment and napping. However, if sleep debt builds up over a week or two, people must be given the opportunity to repay it by at least two normal sleep periods over two or three consecutive days.
- ✓ DO ensure ship design specifications for lighting, noise, vibration, climate and motion exceed the levels associated with human harm, so that they also meet crew needs for rest and the avoidance of stress. The full needs of seafarers can best be met by a human factors integration plan that accompanies the life of a new project from its earliest stages.
- ✓ DO develop an organisational culture that supports openness of information and its timely communication between employees at all levels and between crews and their families. Along with design, it is the best way of reducing stress among seafarers.

Be Careful Not To:

- *Assume that fatigue is an inevitable part of seafaring life. People who are tired have accidents. Accidents cost companies seriously large amounts of shareholders' money and seriously large amounts of pain and misery. The STCW and ILO working hours are maximum limits, not recommended norms. It is not normal in any other human profession – let alone a safety-critical one – to work 13 hours a day, every day, for months on end.*
- *Make the mistake that fatigue is simply due to long hours and workload. These factors are certainly direct causes, but other factors help determine the onset of tiredness. These include physical fitness, diet, interest in the task and its perceived riskiness, the time of day, the physical environment (i.e. light, noise, vibration, motion) and sleep disruption due to stress. All of these need to be addressed in an effective fatigue management plan.*
- *Confuse human arousal with stress. People need to be aroused within certain limits in order to maintain their levels of alertness. However, stress is always bad since it signifies that the person is failing to cope with the demands placed upon them. Stress leads to bodily changes and illness that only make the situation even worse for the person affected.*