

WHY HIGH RELIABILITY ORGANISATIONS FOR THE UK'S NUCLEAR INDUSTRY?



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The nuclear industry is likely to face increasing challenges to safe operations in the near future with the upgrading of reprocessing infrastructure, the ongoing decommissioning programme, and the design and build of new nuclear power plants. Not only do these activities present technological challenges, they also pose potential safety risks as new alliances between companies are formed, and an influx of workers enter the industry who may be unfamiliar with the importance of a positive safety culture for reliable and safe operations.

We all have an idea of what makes something reliable, and generally think of this as something that is consistently good in quality, performance, and to be trusted. In nuclear engineering, the International Atomic Energy Association (IAEA) defines reliability as 'the probability that a system or component will meet its minimum performance requirements when called upon to do so'.¹

But what makes a workforce reliably safe?

Some organisations seem to be able to operate in extremely trying conditions and yet remain effectively error-free. These High Reliability Organisations (HROs), where quick thinking to avoid errors, and fast response times to unexpected safety failures, are all part of daily operations, manage to stay safe and reliable even when operating at the 'edge of the envelope'.

HRO practice is exemplified by operations in US nuclear power stations and US nuclear-powered aircraft carriers. Personnel on nuclear aircraft carriers, for example, manage the simultaneous take-offs and landings of jets laden with munitions, on floating airfields that are only 333 metres long.

These 'supercarriers' are powered by two nuclear reactors, and are manned by around 3,000 crew – mostly under 21 years of age, one-third of whom rotate every 12 months. Despite these daily challenges, they still manage to operate virtually error-free.

While the 'HRO heritage' has been founded in the United States, how HROs operate to maintain safety and reliability is of keen interest to UK nuclear regulators.

HROs manage to stay safe and reliable even when operating at the 'edge of the envelope'

In the final report on the Japanese Fukushima Daiichi nuclear incident (11 March 2011), the Office of Nuclear Regulations (ONR) – the principal regulator for safety and security in the nuclear industry – highlighted the need for HRO approaches in the UK.² This is supported by the Health and Safety Executive (HSE) Safety Assessment Principles (SAPs) that are used to guide regulatory decision-making in the nuclear permissioning process. These SAPs advise that 'leaders at all levels should focus the organisation on achieving and sustaining high standards of safety and on delivering the characteristics of a High Reliability Organisation'.³

Resilient performance is a result of the way in which HROs attend to their business.

What are the characteristics of an HRO?

HROs have certain structural features; they are typically very complex systems that demand a large degree of redundancy (system back-ups, and more than one person to do a particular job), and have command and control regulations where members in the organisation have a high level of accountability.

HROs work under the assumption that their first error may be their last, and recognise that the cost of error can be potentially much greater than the value of any lessons learnt. Consequently, HROs have a strong focus on getting things right first time. Compliance is the norm, and since a strict adherence to procedures is expected, the processes that people follow are designed to be meaningful.

While HROs have strict hierarchies, and high expectations of compliance, they are also exemplified as having a high degree of trust. Trust is an important component in the development of a safety culture, and 'safety leadership' directly influences safety performance, i.e. the more a leader promotes trust from his or her workers, the more a worker reciprocates by increasing their commitment to safety. In HROs, this is demonstrated by flexible, decentralised decision-making at times of crisis, where personnel with the greatest level of expertise, regardless of 'rank', are empowered to make on-the-spot decisions.

So, in an HRO, is it more than just good processes?

While robust operational procedures, good processes and state-of-the-art technology are paramount to safe working practices in HROs, such as nuclear powered aircraft carriers, this is not the whole story. The essential 'human factors' element gives us an important clue as to how these organisations generate and maintain their positive safety culture, i.e. there is a strong emphasis on how people interact and work together.

Resilient performance is a result of the way in which HROs attend to their business. Individuals share 'organisational mindfulness', and have a shared and valued understanding of what is important; this allows them to anticipate and manage unexpected events, if and when they arise. Mindfulness is a way of operating that does not rely on technology, system back-ups, or more than one person to do a particular job. This means that HRO performance is not confined to nuclear aircraft carriers and nuclear power station operations, but can be seen in a range of work places, such as chemical plants and healthcare emergency departments.

Does mindfulness offer the UK nuclear industry a way forward?

When we act in a mindful manner, it generates the resilient performance seen in HROs. Mindfulness encourages us to respond to near misses, heightens our focus on potential failures, and increases our 'situational awareness'. These factors enable us to anticipate and act on weak signs of failure that can be isolated while still minor, and make continuous adjustments to prevent small errors accumulating and escalating into larger events.

Mindfulness gives us a foundation on which to build self-sustaining safety cultures. It can guide thinking and behaviour across all levels, from leaders who chart organisational direction, to senior engineers who determine the technology to be used, through to craft personnel and general workers operating at the workforce.

Operating in an HRO-like manner is expected for nuclear licensees, and the ONR has specific objectives relating to the building and embedding of safety cultures at nuclear sites. However, an HRO focus should not only reside with licensees, it should be engrained in the 'DNA' of any company or alliance working in the nuclear industry.

To find out more about how HRO practice and organisational mindfulness can help to develop safety cultures in the nuclear industry, contact Tom Anderson at Blue Stream Consulting on

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