

# LADDER CLIMBING

## A DETAILED ERGONOMIC ASSESSMENT



In partnership with  
energy  
institute

## CASE STUDY

Key risks (short- and long-term) to technicians in the offshore wind industry

Project partners

University of Portsmouth, G+ members and associates

## Challenge

A typical offshore wind turbine generator (WTG) tower can be 80 m to 120 m high. There is little published research examining the effects of ladder climbing on the physiological demand and the adequateness of current industry physical fitness standards to assess a technician's ability to undertake the expected level of ladder climbing.

- Prolonged ladder climbing is an infrequent but essential task when working in the wind industry
- Little research exists on physiological demand of prolonged ladder climbing
- Adequateness of current physical fitness standards regarding ladder climbing is in question

## Solution

The University of Portsmouth (UoP) was contracted in 2017 by the G+ Global Offshore Wind Health and Safety Organisation (G+) and the Energy Institute (EI) to provide a detailed ergonomics assessment, identifying the key risks to technicians associated with ladder climbing in the offshore wind industry.

The project team conducted a review and analysis of existing literature on ladder climbing and the effects of this activity on the human body, both short- and long-term.

A task analysis was used to determine the critical tasks perceived to be the most physically demanding for wind technicians. An ergonomic assessment of ladder climbing identified the key risks associated with this task and determined if the current assessments of fitness are appropriate for predicting ladder climbing ability. Additionally, a thermal study investigated the effects of heat stress on the technician whilst climbing and their ability to perform their work safely after multiple ladder climbs.

# Results

- The short nature of previous assessments on ladder climbing makes it difficult to generalise findings to wind technicians.
- Ladder climbing is a combination of multiple components of fitness such as mobility, upper and lower limb strength, strength-endurance, and aerobic capacity.
- The most physically demanding critical tasks for wind technicians are: transferring from the vessel to the transition piece, ascending the internal ladder, manoeuvring through hatches, torquing and tensioning, and hauling a casualty up the tower.
- Ladder pitch, rest breaks and climbing technique all influence the physical demand associated with ladder climbing.
- Ladder climbing can impair the ability to perform a task with a fine motor control component.
- Technique and experience improve performance, reduce the physiological burden and maintain optimal movement patterns for longer.
- To decrease the risk of hyperthermia following prolonged ladder climbs (30m-120m), wind technicians should be given the opportunity to cool down and rehydrate.
- All relevant physical components (e.g. strength, muscular endurance, flexibility) are not assessed by the current medical guidelines, nor is there standardisation across organisations for the assessments that are used (e.g. measurement of aerobic fitness).

# Key findings

- The minimum climbing speeds recommend for the Oil and Gas Industry (24 rungs.min<sup>-1</sup> and 34,5 rungs.min<sup>-1</sup>) are not suitable for use within Wind Power and should not be used to set standards to assess physical fitness.
- Current medical fitness standards available for wind technicians are limited, and often not based on the actual job demands associated with working offshore on wind turbines.
- Further investigation is required to quantify the physical demands of the critical tasks, e.g. through developing an industry standard for the minimal acceptable rate to ascend an internal ladder.
- To optimise the well-being and reduce the risk of injuries new wind technicians and infrequent climbers would benefit from a training package that optimises efficient climbing technique.

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## Organisations involved

The School of Sport, Health and Exercise Science at the University of Portsmouth (UK) is part of the Faculty of Science and Health. They study the physiology, psychology and biomechanics of the human body during exercise and its application to health and sports performance. Supported by their laboratories and testing facilities, they examine the role of physical activity in health and disease as well as approaches to optimising human performance.

The Global Health and Safety Organisation (G+) brings together the offshore wind industry to pursue shared goals and outcomes. It is run in partnership with the Energy Institute, which provides the secretariat and supports its work.

The Energy Institute (EI) is the chartered professional membership body for people who work across the world of energy. The EI's purpose is to create a better energy future for its members and society by accelerating a just global energy transition to net zero.