Never miss a critical step

Operational implementation of the Bow-Tie

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Operationalizing Bow-Ties

Bow-ties offer a powerful tool for analysing and presenting risk information, but how can they achieve their full potential in the workplace? We explore, and present, a new methodology for risk reduction and staff engagement.

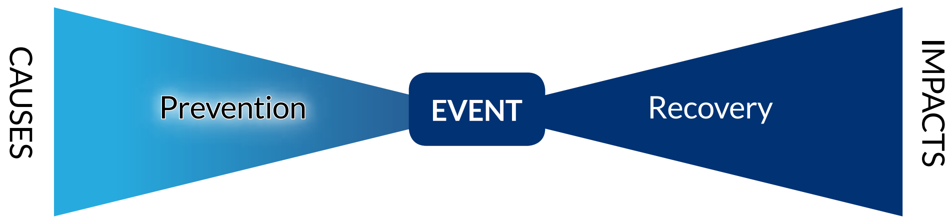
Operational implementation of the Bow-Tie delivers the crucial connection between risk controls (whether hardware or human intervention) and people, it acts as a core component of the management system and delivers both operational and safety improvements. When implemented it has the potential to:

- Inform, influence, and guide the way people work.
- Ensure that safety barriers are effective.
- Connect activities and tasks to the competence of the workforce.
- Deliver real time oversight.

Background

Bow-Ties help to visualize the relationship between the causes of accidents (failures), the controls preventing such events from occurring and the preparedness measures in place to limit business impact. Extensively used in the oil and gas, energy and chemicals industry the technique has more recently been adopted across many sectors including finance, medical and aviation.

The Bow-Tie



The core strength of the technique lies in the connectivity across the left and right-hand sides of the model, allowing prevention and recovery to be analyzed and understood. Traditionally the results have been used to inform changes to work practices through procedural changes, changes to equipment design and workplace communications.

However, Bow-Tie studies remain largely a paper-based exercise conducted remotely from the workplace. This paper presents a new approach to operationalizing the Bow-Tie by directly linking it to work activities, ensuring that information is available in a useable format at the point of work to guide, instruct and develop personnel.

Project

The Bow-Tie optimisation project allowed a fundamental rethink of the approach to control of work activities and hazard management. With minor adjustments to the methodology plus the introduction of supporting software we have moved risk and hazard studies from the classroom and office to, in this case, the drill floor. To achieve this, we created feedback loops within the Bow-Tie process that allowed hazard and barrier information to be used to control work activity and develop staff competence.

The paper records the steps taken to manage holistic change in the specific context of land drilling in the Middle East across multiple drilling sites.

Step one – Optimisation and the Bow-Tie model

Step two – Business optimization and work activity

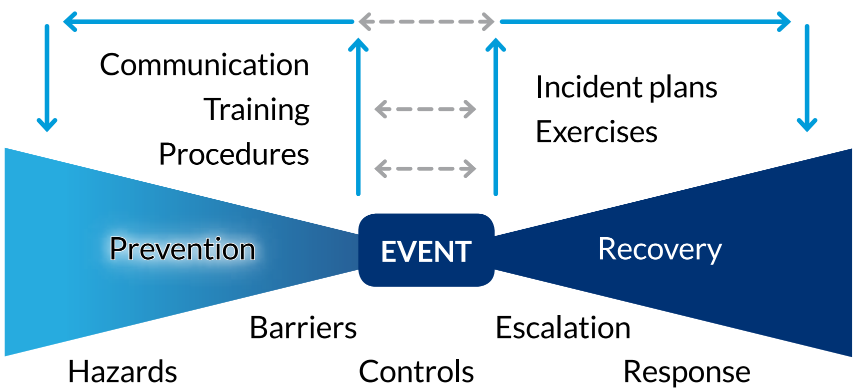
Step three – Procedures and process; designing the information and support systems

Step four – Workplace learning and development

The Bow-Tie

Traditional Bow-Tie studies improve hazard control through communication, training and revision of procedures, largely focusing on the hazards and safety barriers preventing the event. This project connected the Bow-Tie methodology from a hazard study to people working in hazardous environments by focusing on the following challenges:

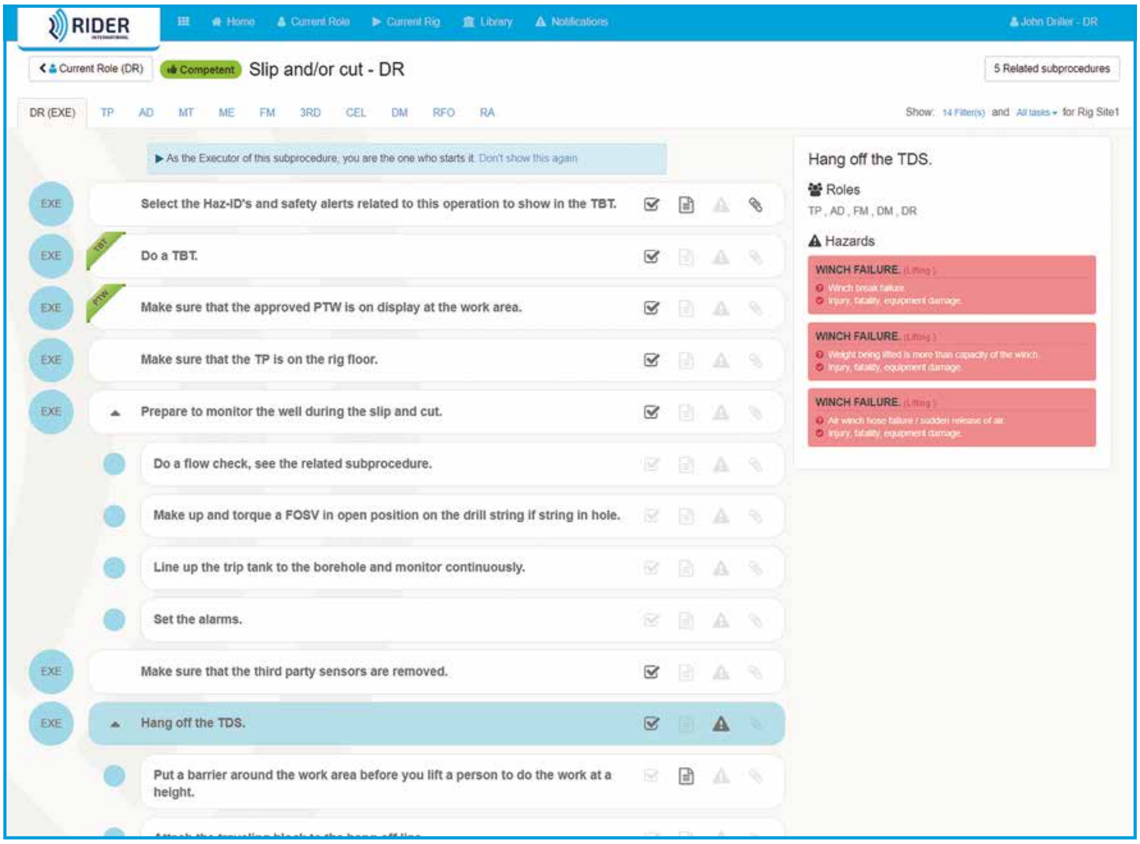
- **Systems** – Ensuring the Bow-Tie analysis links risk mitigation to control of work activities and Management oversight.
- **People** – Matching competence to work activities and continually developing the knowledge and skills of the workforce.
- **Technology** – Developing innovative software solutions which capture the information in a Bow-Tie and deliver tangible benefits and outcomes for people carrying out the work.
- **Safety** – Establishing meaningful, and sustainable, processes that provide a link between safety barriers and work place activities.



Workplace activities

The connectivity between people, tasks, procedures, hardware and management processes was analysed by considering the nature of the work, the hazards and risks. Stage one was to consider the influence of planning through to the point of delivery of work, secondly the resulting critical tasks and the integrity of the risk controls were reviewed against the Bow-Tie analysis. Structuring this information in a format that would be accessible to the rig crews and usable in the workplace led to the implementation of a unique software solution that was designed to link competence, procedures and operational controls.

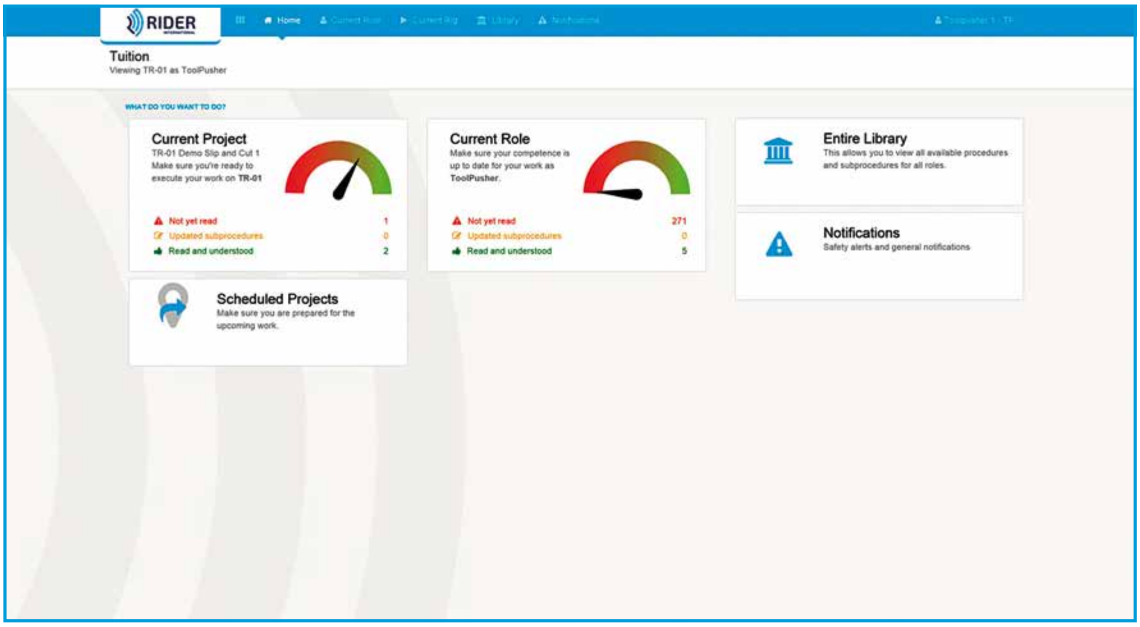
This allowed the software to link planned work activities to procedures, training and risk information, using the Bow-Tie analysis to highlight critical tasks with information on the integrity of the safety barriers (risk controls) being available to the workforce and the supervisors. With this information being made available in the workplace each critical activity is supported by the latest guidance and information on the safety barriers. This means that individuals, their supervisors and their team receive simple instructions with relevant information on the task to be completed, the hazards associated with the work and the safety barriers that protect them.



People

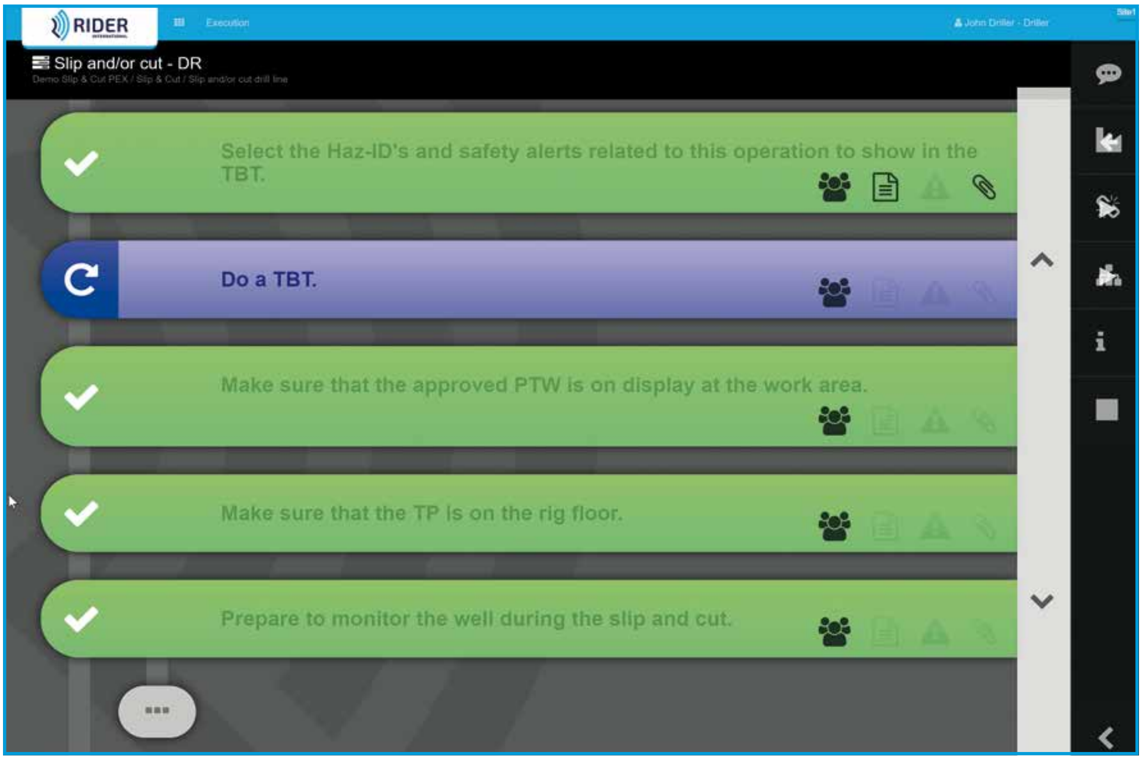
Drilling is a complex operation that requires team interaction. The software allows for mapping work activities to the various positions in the crew, so the toolpusher and driller can view the experience of their team. It maps the individuals on site to the tasks at hand and shows the variations in skills and experience. This helps to assess team readiness in relation to changing patterns of the shifts, personnel absence and new starters.

At any moment in time, the ‘health’ of the barriers which relate to competence and experience can be observed and appropriate action taken by the toolpusher or driller.



Workplace Learning and development

At the start of the project there were strong indications of significant operational variations across the different sites affecting quality, completion times, project costs, variations in incident and accident records all pointing to significant differences in local work patterns. Intervention focused on the competence and knowledge of people, the control of work activities and the organisations management processes including safety management.



The learning and development model was altered from traditional classroom learning to one that ensured competence reflected the real challenges facing personnel. This meant integrating routine operations with knowledge of the safety barriers and major incidents. This information was made available to the crew both before and during the operation, directly pointing to only those barriers relevant for the tasks at hand. In effect, this delivered a continuum of learning and experience from the classroom to the workplace focusing on the relevant and preventing an overload of information.

Conclusion

The key to successful engagement with the rig crews was the supporting software that was deployed. It allowed the planning and execution of activities to be linked to the continual development of competencies whilst supporting team leadership. The result is a system that ensures continual improvement and delivers risk reduction. By integrating the Bow-Tie analysis with a new learning and development model the system was capable of supporting, monitoring and continually improving the competence of the crew in the workplace. Safety management was fully integrated into the daily work activities by ensuring relevant guidance, information and support are available from the moment the team start work. By building the processes around the Bow-Tie methodology we made sure that the result of the Bow-Tie analysis has become an integral part of the operational systems.

The rig crews are confident they will never miss a critical step and management are confident that safety barriers will be in place.

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