HUMAN PERFORMANCE
OIL & GAS

BEST PRACTICE

Managing Human Failures

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MANAGING HUMAN FAILURES

Everyone can make errors no matter how well trained and motivated they are. However, in the workplace, the consequences of such human failure can be severe. Analysis of accidents and incidents shows that human failure contributes to almost all accidents and exposures to substances hazardous to health.

Types of Human Failure

There are two main types of human failure: ***errors*** and ***violations***.

A human *error* is an action or decision which was not intended. A *violation* is a deliberate deviation from a rule or procedure.

Errors that are slips or lapses	Often "actions that were not as planned" or unintended actions. They occur during a familiar task and include slips (e.g. pressing the wrong button or reading the wrong gauge) and lapses (e.g. forgetting to carry out a step in a procedure). These types of error occur commonly in highly trained procedures where the person carrying them out does not need to concentrate on what they are doing. These cannot be eliminated by training, but improved design can reduce their likelihood and provide a more error tolerant system.
Errors that are mistakes	Errors of judgement or decision-making where the "intended actions are wrong" i.e. where we do the wrong thing believing it to be right. These tend to occur in situations where the person does not know the correct way of carrying out a task either because it is new and unexpected, or because they have not be properly trained (or both). Often in such circumstances, people fall back on remembered rules from similar situations which may not be correct. Training based on good procedures is the key to avoiding mistakes.
Violations (non-compliances, circumventions, shortcuts and walk-arounds)	These differ from the above in that they are intentional but usually well-meaning failures where the person deliberately does not carry out the procedure correctly. They are rarely malicious (sabotage) and usually result from an intention to get the job done as efficiently as possible. They often occur where the equipment or task has been poorly designed and/or maintained. Mistakes resulting from poor training (i.e. people have not been properly trained in the safe working procedure) are often mistaken for violations. Understanding that violations are occurring and the reason for them is necessary if effective means for avoiding them are to be introduced. Peer pressure, unworkable rules and incomplete understanding can give rise to violations.

Key Principles in Managing Human Failure

- Human failure can be identified and managed.
- Error reduction should be tackled in a structured and proactive way. Managing human failure should be integral to the safety management system.
- A poorly designed activity might be prone to a combination of errors and more than one solution may be necessary.
- Risk assessments should identify where human failure can occur in safety critical tasks and the control measures in place to prevent it.
- Incident investigations should seek to identify why individuals have failed rather than stopping at “operator error”.

Common Pitfalls in Managing Human Failure

There is more to managing human failure in complex systems than simply considering the actions of individual operators. However, there is obvious merit in managing the performance of the personnel who play an important role in preventing and controlling risks, as long as the context in which this behaviour occurs is also considered.

When assessing the role of people in carrying out a task, be careful that you do not:

- Assume that an operator will always be present, detect a problem and immediately take appropriate action.
- Assume that people will always follow procedures.
- Rely on operators being well-trained, when it is not clear how the training provided relates to accident prevention or control.
- Rely on training to effectively tackle slips/lapses.

Human Factors in Risk Assessment

Key principles in integrating human factors in risk assessments:

- Through your risk assessment, you should have identified those tasks which are safety critical or expose people to occupational health hazards.
- Ensure you have an understanding of how these tasks are carried out and the environment in which they are performed. This may include walking and talking through the task where it is carried out.
- The people carrying out the assessment should have an understanding of the different types of failure and the factors that make them more or less likely to occur.
- Identify the human failures that could be made in the task which might lead to an accident of incident and the performance shaping factors that make those failures more or less likely to occur.
- Identify appropriate control measures which prevent or mitigate the human failures you have identified.
- Check that your control measures work. Regularly review your risk assessment to see if any further improvements can be made.

Understanding the Task

Identifying the potential for human failure in preventing an accident or exposure to substances hazardous to health requires having a thorough understanding of the task the person is carrying out.

A thorough understanding of the task can contribute to:

- Accurate and workable procedures.
- Assuring the competence of operators.
- Workload analysis.
- Design of workstations, plant and control systems.
- Human error analyses as part of a risk assessment.

Most methods for achieving an understanding are based on observations of the task and physically demonstrating the task in a walk-through talk-through on the plant or equipment where the task is carried out. Specific methodologies deal with how the information collected is organised.

Walk Through Talk Through

The walk-through talk-through is a simple process which consists of an experienced person demonstrating how the task is carried out. Each step, no matter how minor (pressing a switch) or effortful (walking to the other end of the premises to collect a tool), is demonstrated. This includes communicating with other people, retrieving information from computers or display systems and making decisions on information retrieved.

As the task is being demonstrated, it's important that what might go wrong is clearly highlighted if the steps are not carried out properly. The potential for human failure and anything that might make that step more or less easy to perform (e.g. poor lighting, noise, restrictive PPE) should also be made clear.

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Important considerations and precautions to assist with a safe and effective walk through talk through exercise.

WALK THROUGH the task step-by-step at the worksite.

TALK THROUGH what could go wrong at every step of the task, no matter how minor.

The goal is to understand how the task is really done.

Make sure the task is being walked talked through as if it was really being carried out.

Consider consequences: Personal injury, asset/equipment or environmental damage, loss caused by uncontrolled release of energy (e.g. pressure, motion, electrical), dropped object, loss of control/containment, collision, slips, falls, fire etc.

- ☐ **Identify which step is more likely to cause errors or mistakes, and steps that are less easy to perform.**
  Steps where there is the potential for loss of concentration, distraction, repetition, multi-tasking, manual handling etc.
- ☐ **Identify factors that may affect personnel and their ability to function and communicate.**
  Such as access, restricted work areas, noise, poor light, concurrent operations, work at height or over the side.
- ☐ **Locate and check the specific tools, instructions, controls and procedures required for the task.**
  Such as materials availability, spares, isolations, signage, translations, accessibility of media (online systems may not be available), locate and demonstrate PPE etc.
- ☐ **Identify information or feedback from systems and equipment that are critical to making decisions.**
  Such as status, warnings and alarms, limits, gauges, safety and fail-safe systems etc.
- ☐ **Read, interpret and understand this information and any related actions, roles and responsibilities.**
  Such as instructions to suspend, stop, reduce, isolate, repair, report etc.

PERFORMANCE SHAPING FACTORS	KEY CONSIDERATIONS	RECOMMENDATIONS
Task Steps: Potential for mistakes to be made, task is inefficient or ineffective in reality (ie due to environment, method etc)	*Which stages are critical / could result in high consequence if mistakes are made? Can it be done a different way or another suitable time?*	Walk through procedure. Introduce frequent time-outs and reviews of Toolbox Talk. Review shared learnings that relate to the task. Seek advice from experts.
Task Types: Unusual, infrequent, unfamiliar task. Boring, trivial repetitive actions. Requires 'multi-tasking' or other activity part way through the task.	*Is there a potential to 'switch off' or do the task on 'auto pilot'? What changes or information might be missed? Could multi-tasking lead to loss of concentration?*	Select correct personnel for the task. Ensure good ratio of experience. Regular breaks, monitor attention levels.
Task Challenges: Complex system controls, interfaces and alarms. Unclear labels, signs, signals, instructions or other unfamiliar information. Tight schedule. Specific PPE restricts movement.	*Is information understandable, missing, damaged or different? Interfaces verified? Can equipment or zone labels be misinterpreted (ie wrong plant or wrong area)? Is time pressure a reality or perceived? Any PPE challenges?*	Compare and verify instructions/information with actual equipment and location. Confirm schedule allows for variation. Discuss time constraints. Don PPE and identify any issues, (inc cleaning, change out etc)
Task Controls: Series of complex or difficult to understand steps. Specific tools and equipment required. Specific PPE required. Multiple persons required at individual steps.	*Task clearly clearly understood ? Does the procedure make all steps clear? Are the procedures and tools close at hand? How many people do we need for the task? Which controls are in place to manage hazards?*	Talk through each step of the task at the worksite. Identify and locate procedures, tools, equipment and controls. Ensure all personnel have a role. Verify all hazard management controls are in place.
Task Environment: Noise, heat, lighting, space, ventilation, open access, other operations etc affecting the person completing the task. Concurrent operations, interruptions and distractions.	*Does working environment affect communications or line of sight, or cause someone to miss key information? Does the task require high vigilance or concentration? How can interruptions affect the task?*	Eliminate environmental factors where practicable. Move items that present access or create restrictions. Plan around concurrent operations. Ensure toolbox talk is reviewed after interruptions.
Task Communications: Task requires communication between colleagues, supervision and contractors. Relies on personnel recognising emerging hazards, risk or change.	*Have communication methods been agreed and are they effective for the environment? Could information quality be poor during verbal and written communications? Could a person engaged in the task miss a situation change?*	Test communications regularly, including verbal and signals. Verify that written instructions can be understood. Introduce regular Time Outs to check for changes. Enforce Stop Work Authority.

BE VIGILANT. ALWAYS STOP THE JOB IF YOU FEEL IT IS UNSAFE.

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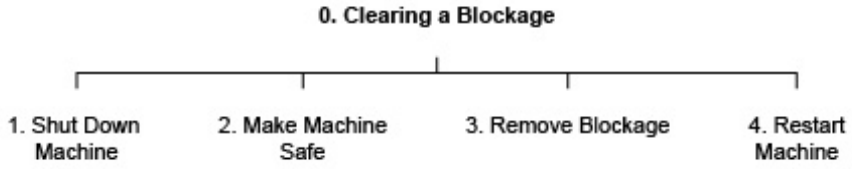
This handy worksite Walk Through Talk Through prompt card and poster is available for download at the HPOG website.

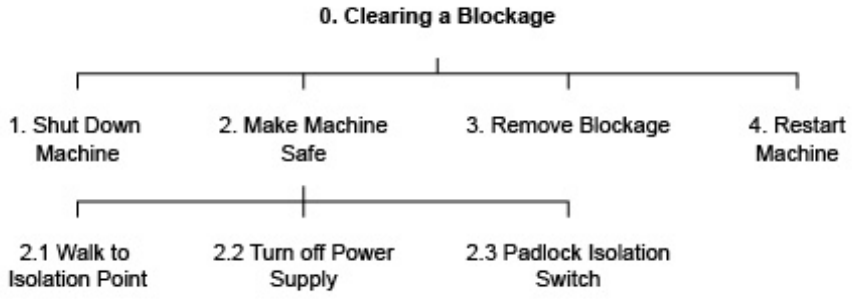
Hierarchical Task Analysis

Hierarchical task analysis (HTA) is a way of organising the data collected during the walk-through talk-through in a systematic way. The key advantage of an HTA is that it allows consideration not just of each task step, but of the way in which task steps are related to each other, the order in which they are carried out and what would happen if a group of task steps were missed.

The usual process is to identify the goal of a procedure e.g. 'clearing a blockage on the machine'. The task steps identified through the walk-through/talk-through are then grouped into operations necessary to achieve the goal.



Each main operation can then be broken down into sub-operations.



The next step is to draw up "plans" which specify the order in which the operations should be carried out. Plan 0, for example, would be "Do steps 2 to 4, if blockage cleared, continue, if blockage remains repeat steps 1 to 4 in order". Plan 2 would be "Do steps 2.1 to 2.3 in order".

Based on the walk-through talk-through, the preconditions for achieving the goal are identified. This might include the availability of sufficiently trained staff, the necessary tools, time restraints and so on.

The HTA contains four components namely The Goal; Operations and Sub-operations; Plans; Preconditions

Each of these can be analysed for potential failure in addition to the operational failures that might occur in each task step as identified in the walk-through talk-through. For example:

- What if the operator has the wrong goal?
- What will the operator do if a precondition is not available?
- What if a plan is carried out in the wrong order?
- What if a plan is not carried out at all?

Potentially go into detail on Link Analysis and Time-line Analysis.

Human Factors in Investigations

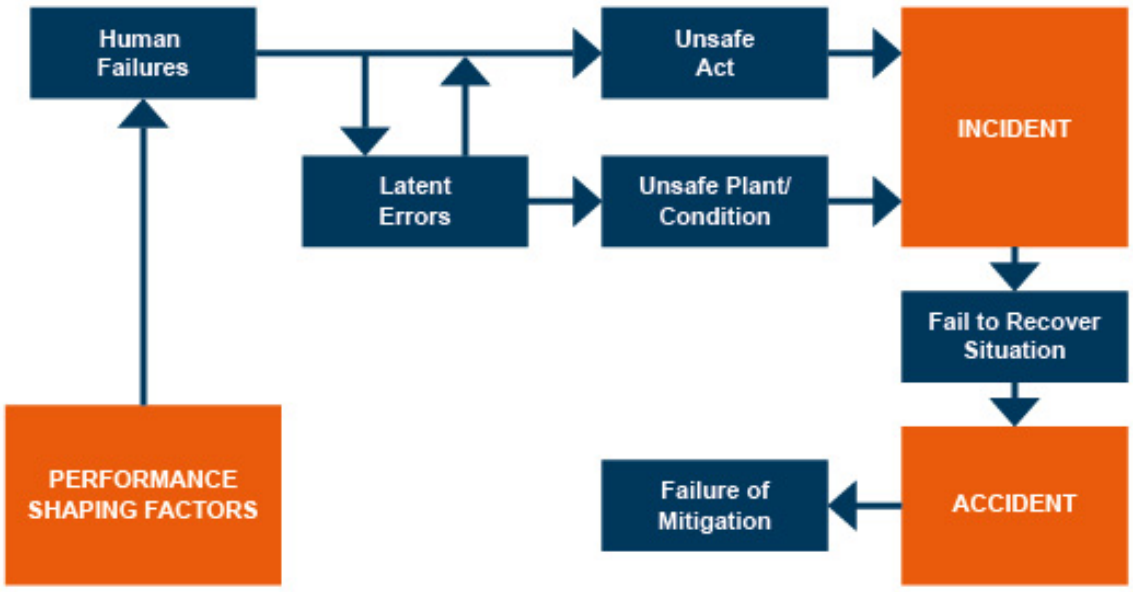
Accident investigations should consider why human failures occurred. Finding the underlying (or latent, root) causes is key to preventing similar accidents.

Active failures have an immediate consequence and are usually made by machine operators or control room staff. In a safety-critical environment these active failures can have an immediate impact on health and safety.

Latent failures are made by people whose tasks have been removed over time, for example designers, decision makers and managers. Latent failures are typically failures in health and safety management systems. Examples of latent failures are:

- Poor design of plant and equipment.
- Ineffective training.
- Inadequate supervision.
- Ineffective communications.
- Inadequate resources (e.g. people and equipment).
- Uncertainties in roles and responsibilities.

Latent failures are usually hidden within an organisation until they are triggered by an event likely to have serious consequences.



People can cause or contribute to accidents (or mitigate the consequences) in a number of ways. Through a failure a person can directly cause an accident. However, people tend not to make errors deliberately. People can make disastrous decisions even when they are aware of the risks. We can also misinterpret a situation and act inappropriately as a result.

On the other hand, people can intervene to stop potential accidents. Mitigation of the possible effects of an incident can result from sound decision making and leadership.

The degree of loss of life can be reduced by the emergency response of operators and crew. Emergency planning and response including appropriate training can significantly improve rescue situations.

Investigating the Causes of Accidents

After an accident involving human failure, finding out both the immediate and underlying causes of an accident is key to preventing similar accidents.

Performance shaping factors are situations that could prompt a person to make a mistake in certain circumstances.

Identify Performance Shaping Factors	Key Considerations
Task Steps: Can mistakes be made, or is the task inefficient or ineffective in reality (i.e. environment, location, method)?	Do we know which stages are critical or could result in high consequence if mistakes are made? Are there opportunities to find a different way or time to complete the task?
Task Types: Is the task unusual, infrequent, unfamiliar. Is it potentially boring with trivial repetitive actions? Does it require 'multi-tasking' or a requirement to do something else part way through the task?	Do we have the necessary skills, capabilities and experience? Is there a potential to 'switch off' or do the task on 'auto pilot'? What changes or information might be missed? Could multi-tasking lead to loss of concentration?
Task Challenges: Are there complex system controls, interfaces, alarms? Unclear labels, signs, signals, instructions or other information? Is there sufficient time to complete the task effectively?	Can we understand the information and is anything missing, damaged or different? Can all interfaces be verified? Is there potential for equipment or zone labels to be misinterpreted (i.e. wrong plant or wrong area)? Is time pressure a reality or perceived?
Task Controls: Are there any complex or difficult to understand steps? Are the right tools and equipment available? Are there enough people to complete the task?	Do we clearly understand the task and does the procedure make these steps clear? Are the procedures and tools close at hand? How many people do we need for the task?
Task Environment: Could noise, heat, lighting, space, ventilation, open access, other operations etc affect the person completing the task? Can these cause interruptions or distractions?	How will the environment affect communications or line of sight, or cause someone to miss key information? Does the task require high vigilance or concentration? How can interruptions affect the task?
Task Communications: Does the task require communication between colleagues, supervision, contractors? Does it rely on recognising emerging hazards, risk or change?	Have communication methods been agreed and are they effective for the environment? How could information quality be poor during verbal and written communications? How might a person engaged in the task miss a situation change?