



## Practice with guidewords

- The following table shows a parameter and guideword illustrated by a particular event with practical consequences

Parameter	Guideword	Illustrated by....	Practical consequences...
Level	High	Overfilling a tank	Liquid spill

- Select one answer from the following examples.

Parameter	Guideword	Illustrated by....	Practical consequences...
Pressure	No	Failure of compressor Vacuum Broken pressure gauge	Loss of reaction pressure Tank sucked in Lack of pressure reading





## Practice with guidewords.

- Try two more examples:

Parameter	Guideword	Illustrated by....	Practical consequences...
Containment	Part of	Mechanical failure pump seal Overflow of tank Vessel manhole cover dropped	Leak and ignition at pump Oil spill Damage by mechanical impact



Parameter	Guideword	Illustrated by....	Practical consequences...
Action	other than	Instead of action fails to act Performs extra action Wrong action performed	Forgets to change filter Opens in service and standby filter Opens filter in service





## Why I think the answer you chose is not correct ...

■ You selected

Parameter	Guideword	Illustrated by....	Practical consequences...
Containment	Part of	Mechanical failure pump seal	Leak and ignition at pump
		Overflow of tank	Oil spill
		Vessel manhole cover dropped	Damage by mechanical impact

...but that is not what went wrong. The tank has not failed but the operator failed to control the level so I would have chosen 'Level High' for this case

Control of levels in Tank Farms is a perennial problem and fitting LAH is not the answer unless there is regular procedure to dip the tanks to check the LI/LAH is working. LAHH to close the inlet line valve is an option.

Management of drains in tank bunds is related. Do they leave the drain valves closed (and get a flood if it rains?) or opt for convenience and leave the drains open (so any spill escapes to sewer)



## Why I think the answer you chose is not correct ...

■ You selected

Parameter	Guideword	Illustrated by....	Practical consequences...
Containment	Part of	Mechanical failure pump seal Overflow of tank	Leak and ignition at pump Oil spill
		Vessel manhole cover dropped	Damage by mechanical impact

...well the cover is 'part of the containment' but that is not how the 'HAZOP grammar' works. Using 'Part of' is intended to imply the parameter to which it applies is not complete. In this case containment is not complete

What you chose is a credible hazard typically called 'dropped object' It's a worry especially in congested plant offshore. I would normally take this in a HAZOP on a special topic day under 'Maintenance'. Typically it happens because of an error either in slinging heavy lifts or lack of protective scaffolding. It matters went maintenance is done on an operating plant



## Yes I would have chosen the same answer...

■ You selected

Parameter	Guideword	Illustrated by....	Practical consequences...
Containment	Part of	Mechanical failure pump seal	Leak and ignition at pump
		Overflow of tank	Oil spill
		Vessel manhole cover dropped	Damage by mechanical impact

...It's a frequent source of trouble on single seal pumps (check the accident lists for CDU)

There are two things to debate ... using double mechanical seals and installing an ROV to separate the pump from upstream inventory. This matters when the upstream is volatile (LPG) or hot (above auto-ignition) and above a critical volume (typically 7 m<sup>3</sup>). If you go for an ROV remember to fire proof (check the Avon Coker Accident) and to protect the pump by limit switches on the valve (check the C&E diagrams)



## Why I think the answer you chose is not correct...

■ You selected

Parameter	Guideword	Illustrated by....	Practical consequences...
Action	other than	Instead of action fails to act	Forgets to change filter
		Performs extra action Wrong action performed	Opens in service and standby filter Opens filter in service

...I think failing to act would be ' Action No'

The mistake ( forgetting about filters) is easy enough. Typically look for a differential pressure indicator (dPI) across an important filter but avoid long runs of high pressure small bore tubing. In these cases think about two PI with differential by DCS software



## Why I think the answer you chose is not correct...

■ You selected

Parameter	Guideword	Illustrated by....	Practical consequences...
Action	other than	Instead of action fails to act	Forgets to change filter
		Performs extra action	Opens in service and standby filter
		Wrong action performed	Opens filter in service

...I think this is 'Action As well as'

In the example chosen there is probably not a big problem (until both filters block at the same time and perhaps force a shutdown)

Its always worth checking emergency procedures especially where an emergency logic adds extra actions which the operator would not carry out. Emergency depressuring is a potentially hazardous example because of the stress caused and the loading on the blowdown system



## Yes I would have chosen the same answer...

■ You selected

Parameter	Guideword	Illustrated by...	Practical consequences...
Action	other than	Instead of action fails to act Performs extra action	Forgets to change filter Opens in service and standby filter
		Wrong action performed	Opens filter in service

...it happens very occasionally on filters and on other types of equipment

In one plant the PSV arrangement was such that it was guesswork to decide which of the two valves was in service. Make a mistake and the technician could be exposed to high pressure hydrogen rich gas

Sometimes plants car seal valves ( a wire with a lead seal) but this is not foolproof. In one instance an operator broke the seal, opened a valve and exploded a low pressure steam drum putting a steam cracker out of service for 6 months



## Practice with guidewords

- Complete the following proforma by saying for each of the following parameter-deviation combinations
  - How the deviation would be noticed
  - A practical illustration

Parameter	Guideword	Noticed because...	Illustrated by....
Level	High	Liquid spill	Overfilling a tank
Flow	Reverse		
Pressure	No		
Temperature	Low		
Containment	Part of		
Contamination	As well as		
Action	Other than		
Action	Before		



## Practice with guidewords

- Complete the following proforma by saying for each of the following parameter-deviation combinations
  - How the deviation would be noticed
  - A practical illustration

Parameter	Guideword	General effect	Illustrated by....
Level	High	Liquid spills	Overfilling a tank
Flow	Reverse	Flow in wrong direction	Failure of check valve
Pressure	No	Vacuum	Tank sucked in - vent blocked
Temperature	Low	Cooling or Freezing	Ice causes seizure of let down valve
Containment	Part of	Leak of gas or liquid	Mechanical failure of pump seal
Contamination	As well as	Wrong phase or composition	Particulates block filter
Action	Other than	Wrong action performed	Opens standby filter
Action	Before	Right action in wrong sequence	Opens filter before draining contents