HAZID & HAZOP

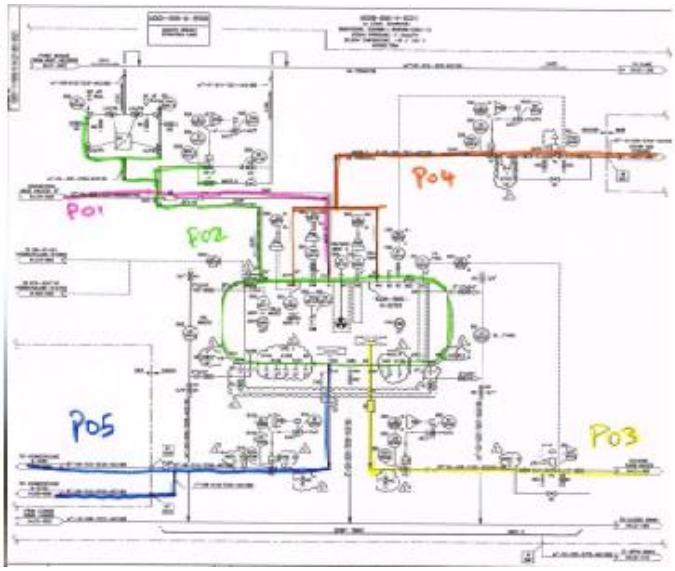
Hazard Identification (HAZID) and Hazard and Operability (HAZOP)

Qualifying Hazards

Hazard Identification (HAZID) and Hazard and Operability (HAZOP) studies form the basis of any risk assessment and an important understanding of potential hazards, possible causes, an assessment of the effectiveness of any safeguards already in place, and identification of possible hazard and risk reduction measures.

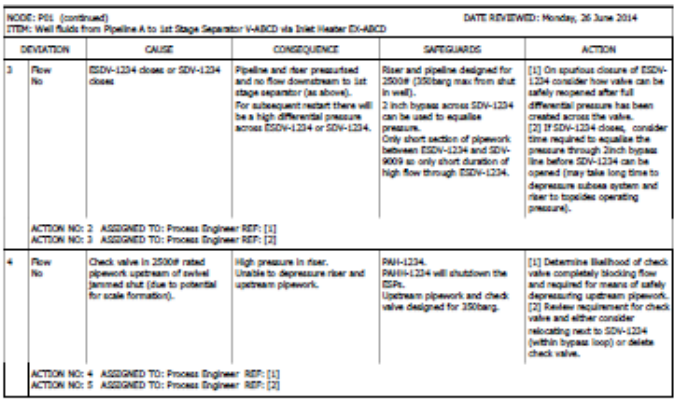
Experience has shown that HAZID and HAZOP are best carried out in a team review format with an independent chair, responsible engineers and operational personnel, relevant specialists and key management.

Anatec has chaired many HAZIDs from offshore operations, including offshore construction activities, marine operations, new pipeline designs, decommissioning and novel applications such as a walk to work vessel operating in close proximity to a floating production, storage and offloading (FPSO) vessel.



(Example node schematic)

Anatec has also chaired a number of HAZOPs, including subsea wells, manifolds, flowlines and risers, FPSO topsides process and utility systems, FPSO marine systems and steam boiler / power generation packages, and unusual HAZOPs such as of a flexible riser annulus vent monitoring system. Anatec has also chaired an "End to End" HAZOP to review an entire project's multiple HAZOP studies to identify any omissions or inconsistencies at interfaces.



	DEVIATION	CAUSE	CONSEQUENCE	SAFEGUARDS	ACTION
3	Flow No	ESDV-1234 closes or SDV-1234 closes	Pipeline and riser pressurised and no flow downstream to 1st stage separator (as above). For subsequent restart there will be a high differential pressure across ESDV-1234 or SDV-1234.	Riser and pipeline designed for 2500# (350barg max from shut in well). 2 inch bypass across SDV-1234 can be used to equalise pressure. Only short section of pipework between ESDV-1234 and SDV-9009 so only short duration of high flow through ESDV-1234.	[1] On spurious closure of ESDV-1234 consider how valve can be safely reopened after full differential pressure has been created across the valve. [2] If SDV-1234 closes, consider time required to equalise the pressure through 2inch bypass line before SDV-1234 can be opened (may take long time to depressure subsea system and riser to topsides operating pressure).
	ACTION NO: 2 ASSIGNED TO: Process Engineer REF: [1] ACTION NO: 3 ASSIGNED TO: Process Engineer REF: [2]				
4	Flow No	Check valve in 2500# rated pipework upstream of swivel jammed shut (due to potential for scale formation).	High pressure in riser. Unable to depressure riser and upstream pipework.	PAH-1234. PAHH-1234 will shutdown the ESPs. Upstream pipework and check valve designed for 350barg.	[1] Determine likelihood of check valve completely blocking flow and required for means of safely depressuring upstream pipework. [2] Review requirement for check valve and either consider relocating next to SDV-1234 (within bypass loop) or delete check valve.
	ACTION NO: 4 ASSIGNED TO: Process Engineer REF: [1] ACTION NO: 5 ASSIGNED TO: Process Engineer REF: [2]				

(Example HAZID worksheet)

Anatec has also reviewed and signed-off HAZOP action responses and collated HAZOP action close-out reports.

The HAZID and HAZOP methodology follows best practice including BS EN ISO 17776:2002: Petroleum and natural gas industries - Offshore production installations - Guidance on tools and techniques for hazard identification and risk assessment, and HAZOP - Guide to Best Practice, I Chem E, 2008.

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