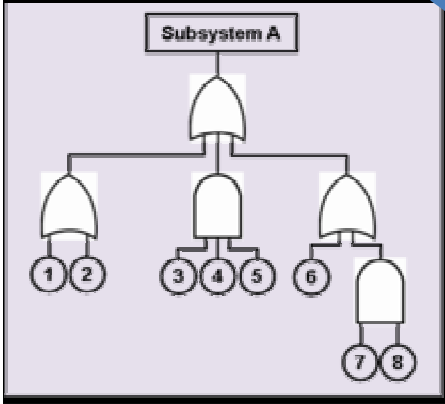


Some (semi-)quantitative tools and techniques for safety analysis of hazardous plant

Fault tree analysis: Conditions required for an unwanted fault to arise are presented in a logical sequences, using Boolean logic, starting from the unwanted fault or 'top event'. Fault trees use 'backward logic', c.f. Event trees.

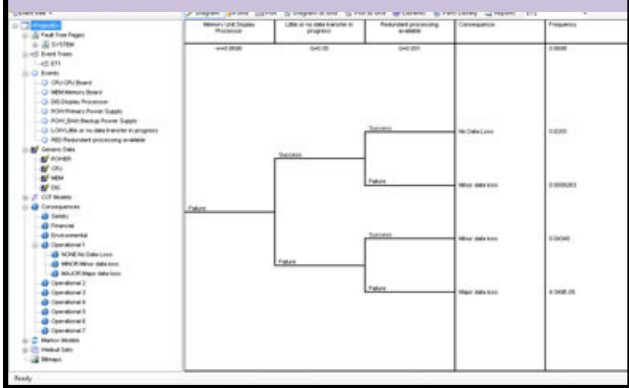


Fault tree analysis
Event tree analysis
FMEA/FMECA
SIL assessment
Risk assessment

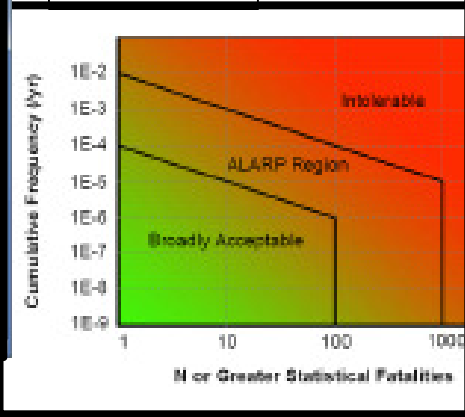
FMEA/FMECA: Sometimes the number of components is just too large to make fault tree analysis practicable. In FMEA, a team identifies potential failure modes based on past experience with similar products or processes. For the assessment of system failure rate, the dangerous failure modes are listed and then probabilities are assigned and summed - this figure is then taken to be the probability of the unwanted system failure ('top event').

SIL (Safety Integrity Level) assessment is used to determine the necessary reliability of instrumentation and control (I&C) systems, in order that overall plant risk criteria can be achieved. The methodology usually involves a team approach, where each fault sequence is considered in turn, with its potential consequences, and the margin of any shortfall against the target risk frequency is used to determine the necessary reliability of the (yet-to-be-designed) I&C systems.

Event tree analysis: Starting from a known plant state, and using binary logic (i.e. failed/not failed), the event tree then charts all possible system states. Event trees use 'forward logic', c.f. Fault trees.



Quantitative Risk Assessment
Semi-Quantitative Risk Assessment



Severity Rating	Consequence					Increasing probability				
	People	Assets	Environment	Reputation	Security	A	B	C	D	E
						Never heard of in E&P industry	Heard of in E&P industry	Incident has occurred in our company	Happens several times per year in our company	Happens several times per year in a location
0	No health effect/injury	No damage	No effect	No impact	No effect	Manage for continuous improvement				
1	Slight health effect/injury	Slight damage	Slight effect	Slight impact	Slight effect					
2	Minor health effect/injury	Minor damage	Minor effect	Limited impact	Minor effect					
3	Major health effect/injury	Localised damage	Localised effect	Considerable impact	Localised effect				Incorporate risk reduction measures	
4	Single fatality	Major damage	Major effect	National impact	Major effect					
5	Multiple fatalities	Extensive damage	Massive effect	International impact	Massive effect				Intolerable	