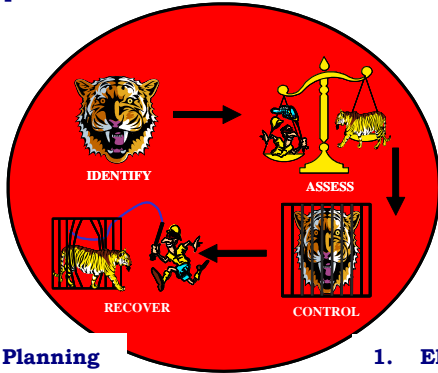


RISK ASSESSMENT AND MANAGEMENT SERVICES

"Do you know where your Tiger Is?"

A primary objective in *Risk Management* for the inherently hazardous industries such as the Oil and Gas Industry is to reduce risks from Hazards to 'As Low As Reasonably Practicable (ALARP)'. *Risk Management* principles and tools include:

- | | |
|-------------------------------|---------------------------------|
| 1. HAZID & HAZOP's | 1. Qualitative Analysis |
| 2. Inspections | 2. Bowtie Analysis |
| 3. Past Experience | 3. Quantitative Analysis |
| 4. Audits | |



- | | |
|---------------------------------|---------------------------------|
| 1. Contingency Planning | 1. Elimination of Hazard |
| 2. Command & Control | 2. Engineered Controls |
| 3. Emergency Response | 3. Procedural Controls |
| 4. Crisis Management | 4. Personal Protection |
| 5. Business Recovery | |

These *Risk Management* processes can be applied to all elements of business but are especially relevant to the assessment and control of HSE Risk.

Hazard Identification: First step is to identify all hazards relevant to subject facility or operations

- Site Walkarounds – Useful ahead of any formal HAZID and especially useful when assessment part of a Job Safety Analysis or Dynamic Risk Assessment
- HAZard Identification (HAZID) - Identifies hazards, considers controls and recommends possible improvements. Can be carried out as desk top reviews, sets of one-on-one interviews, or a HAZID Workshop – with a systematic, facilitated group process.
- HAZard and OPerability (HAZOP) Study – Particular technique for analysing the hazards in process stream – based on reviewing design drawings and 'node by node' identifying possible failures that could release a process hazard
- Inspections and Audits – Systematic visual or documentation and question check that defined controls are in place
- Past Experience – Review of incidents etc



Qualitative Assessment – Risk Matrix:

Assignment of scores to assignment of scores to Likelihood and potential Consequences to give a 'value' to the risk for each hazard. Commonly uses a Risk Matrix.

People (P)	CONSEQUENCES (PEAR)				INCREASING LIKELIHOOD				
	Environment (E)	Assets (A)	Reputation (R)	None	A	B	C	D	E
1	Minor health effect	Minor damage	Minor impact	Minor	Minor	Minor	Minor	Minor	Minor
2	Major health effect	Major damage	Major impact	Major	Major	Major	Major	Major	Major
3	Major health effect	Major damage	Major impact	Major	Major	Major	Major	Major	Major
4	Major health effect	Major damage	Major impact	Major	Major	Major	Major	Major	Major
5	Major health effect	Major damage	Major impact	Major	Major	Major	Major	Major	Major

Hazard Registers – Simple tabulation of Hazards, Risks, Controls, Acceptability of Inherent Risk and Improvement Actions (with accountable party and target date) for risks to be ALARP. Can be very simple word processor table or a little more complex worksheets .. word processor or spreadsheet.



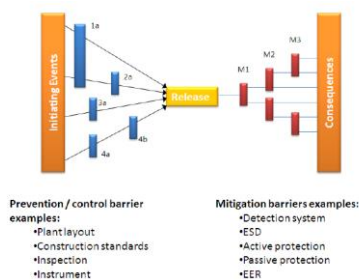
**Minimising Risk
Maximising Opportunities**



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Risk Assessment and Management Services (contd)

Bow-tie Analysis: For major (or main) accident hazards, can extend analysis and assessment to failure of (or missing) controls and controls on this through Bow-tie Analysis. Again these can be very simple visual diagrams, more detailed with spreadsheets recording findings to complex (e.g for process streams) using software.



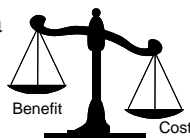
Technical Risk Studies:

CW International itself does not do Technical Risk Studies and QRA but does have Associate company that is very well established and respected to provide support.

HAZOPS, Fire Risk Analysis, FRED, FirePRAN, ERA, EERA etc: Associate Company is well experienced in most necessary safety and emergency risk assessment methodologies. We consult with them on what is necessary for any client's needs and facilitate the overall process to ensure cost effectiveness.

Quantitative Risk Assessment (QRA): Calculation of likelihood and severity of potential accident events. Sum of all realistic accident scenario risks gives indicators such as Potential Loss of Life (PLL), Individual Risk per Annum (IRPA). Associate Company developed a bespoke spreadsheet based tool for QRA for a major multinational and remains able to apply and develop this tool for various applications.

Acceptability of Risk: Judged against defined criteria whether qualitative or quantitative, Company or Government, and perhaps with conditions on improvements (remedial actions).



ALARP Assessments:

Formal documented assessment combining qualitative assessments, technical studies, QRA and cost benefit analysis to decide whether particular risks are "As Low As Reasonably Practicable (ALARP)".

Risk Communications:

Risks, their controls and their 'acceptability' to the Company need to be communicated to various Stakeholders to secure their understanding, input and agreement to the acceptability of those risks. These Stakeholders may include Shareholders, Investors, Regulators, the Community, NGOs. We can help put the information into a language and style that can be understood without losing its technical credibility and to avoid distortion.



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