



# Safety and Business Risk Assessment & Management



*Risktec provides a comprehensive service for identifying, assessing and managing risks to businesses, industries and public sectors. We bring together different functions in an organisation to help manage conflicting requirements and find the optimum way forward.*

*Drawing upon our technical, managerial and commercial skills, we help our clients to minimise loss, protect their corporate reputation and comply with legislation and company standards.*

## WHY RISKTEC?

Helping clients to manage health, safety, security, environmental (HSSE) and business risk is our core focus.

We are totally committed to working with our clients and stakeholders to arrive at pragmatic solutions, with a level of effort proportionate to risk.

We take a fresh view of the big picture, as well as paying attention to the details.

We are free to take a truly independent view and provide impartial advice.

We are committed to developing open and collaborative client relationships and aim to be the long-term partner of choice.

We have a culture of sharing our knowledge with clients, through meetings, presentations, reports, tools and training.

We openly identify potential issues to enable an objective and comprehensive assessment to be made.

## HAZARD IDENTIFICATION

Hazard identification is the first and, in many ways, the most important step in a risk assessment. If a hazard is not identified, it is unlikely to be managed effectively. Risktec provides a full portfolio of services for the formal, systematic and comprehensive identification of hazards:

- HAZOPs, HAZIDs
- Plant 'walkdowns' and surveys
- FMEA and FMECA
- Hazard registers and fault schedules
- Risk ranking and risk assessment
- Incident analysis and human factors reviews

**"Our extensive experience means we select the right technique from the full range of possible tools, to deliver the right results"**

## FIRE, EXPLOSION AND TOXIC GAS HAZARD ANALYSIS

Our services include:

- Site based surveys or 'walkdowns' using checklists
- Physical effects analysis - screening analysis using empirical models, and detailed analysis using CFD models
- Analysis of response and vulnerability of systems and structures
- Fire protection system assessments
- Development of risk reduction strategies
- Assessment and development of escape, evacuation, rescue and recovery plans

**"We use a suite of in-house models and state-of-the-art commercial software, and recommend cost-effective mitigation and emergency planning measures"**

## QUALITATIVE/ DETERMINISTIC RISK ASSESSMENT

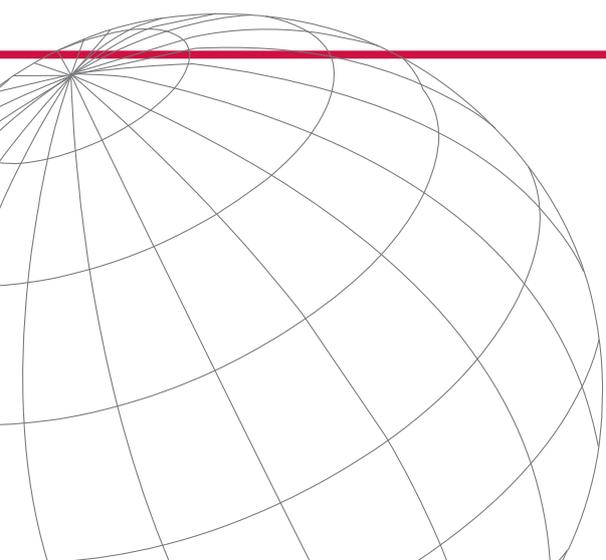
Engineering design requirements for hazardous facilities are becoming increasingly challenging, with operators demanding the highest levels of safety integrity as well as higher production throughputs and more flexibility.

Risktec undertakes deterministic assessment to provide a robust demonstration of the adequacy of engineering designs and the effectiveness of safety systems. The aim is to provide a plant or operation with a level of defence that is proportional to the associated risk.

Assessments can demonstrate, for example, that no single failure will compromise the safety function and ensure that best use is made of segregation, redundancy and diversity. Risktec selects the most appropriate techniques to support the deterministic safety assessment, including:

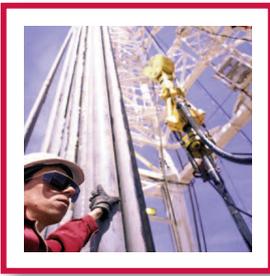
- Hazard registers and fault schedules
- Design basis assessment
- System reliability analysis
- SIL assessment
- Specification of minimum safety requirements
- Specification of trip settings, and limits and conditions of operation
- Risk assessment matrix
- Hazard bowtie analysis
- ALARP assessment and demonstration

**"Formal deterministic safety assessment is increasingly being demanded throughout high hazard industries. Our approach delivers safety benefits where they are needed, without excessive cost"**



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## BOWTIE RISK MANAGEMENT

Most risk assessments present a snapshot of the controls in place for a hazard at a particular moment in time. What is often missing is the link between the controls as they are today and the systems for ensuring they will continue to be effective tomorrow.

Risktec consultants are world leaders in the use of the bowtie method to overcome this problem. The method is easy to understand, encourages involvement and ownership, and enables the practical implementation of hazard management at the operational level, through responsibilities for hardware, procedural and competence systems. Our bowtie services include:

- Developing bowties for HSSE or business risks
- Facilitating bowtie workshops
- Training in the bowtie method and software tools
- Layer of protection analysis (LOPA)
- Identifying safety-critical elements and competency requirements
- Developing bowtie information for hazard and risk awareness
- Incident investigation
- Management control reviews
- Developing audit protocols

We use the **BowTieXP** software tool to efficiently implement the complete bowtie methodology.

**“The bowtie is readily understood at all levels in an organisation and creates ownership of the hazard management process”**

## QUANTITATIVE / PROBABILISTIC RISK ASSESSMENT

The systematic identification and evaluation of the likely consequences and expected frequency of hazardous events is a major input to the risk management decision-making process.

Risktec is a specialist in quantifying risk, from quick, coarse studies to detailed assessments. Many of our professionals have design, operations and management backgrounds, and this experience is used to look beyond the final numbers to interpret the results, communicate the implications to senior management, and provide real and practical recommendations for improvement.

Our services include:

- Consequence analysis to model physical effects of releases of hazardous substances
- Frequency analysis using fault and event trees
- Risk evaluation (PSA/QRA) to predict levels of safety and economic risk
- Cost-benefit analysis to derive an optimal strategy for expenditure using financial and risk criteria
- Sensitivity and uncertainty analyses to provide a greater understanding of risk and enable better informed risk-based decisions
- Facility siting and occupied building risk assessment

**“Our approach to QRA focuses on its practical benefit for effective management of operational and business risks”**

## SYSTEMS DESIGN AND ASSURANCE/FUNCTIONAL SAFETY

Mechanical, electrical, software, control and instrumentation systems play a crucial role in the management of risk.

Risktec considers the complete project lifecycle and interfaces, including specification, design, commissioning, operation, maintenance and decommissioning phases of safety-related and business-critical systems.

Risktec consultants use a range of recognised techniques to assure the performance of these systems in managing operational risks.

Our services include:

- Due diligence for acquisitions, mergers and business ventures
- System specification
- Independent safety assessment and audit
- Hazard identification (e.g. HAZOP, FMEA, human error review)
- Causal and consequence analysis (e.g. fault tree analysis, event tree analysis)
- SIL assignment and verification
- Layer of protection analysis (LOPA)
- Identifying safety-critical elements and developing performance standards and verification schemes
- Design substantiation of safety requirements
- Options analysis
- ALARP assessment

**“At all stages of the project lifecycle, Risktec has proven experience in working closely with the operator and the equipment provider to ensure that the system satisfies the requirements of all stakeholders in terms of time, cost and quality”**



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## AVAILABILITY, RELIABILITY AND MAINTAINABILITY

Availability, Reliability and Maintainability (ARM or RAM) analysis determines the likelihood of plant failure and the time necessary to return the plant to an operational state. This allows the operator to meet availability targets for production throughput and reliability targets for systems, to have sufficient spares and maintenance personnel, and to assure ease of maintenance.

Risktec provides a comprehensive ARM service, including:

- Reliability data collection and analysis
- FMEA and FMECA
- Criticality analysis
- Fault tree, event tree and Monte Carlo analyses
- Reliability-centred maintenance (RCM)
- Risk-based inspection (RBI)
- Performance standards
- Human reliability assessment

By applying ARM techniques in the early phases of the project life-cycle, Risktec identifies any shortfalls against targets and proposes practical solutions which yield significant improvements in availability, reliability and maintainability.

**“Our consultants have a proven track record in the practical application of ARM techniques to manage system downtime and reliability, and assure compliance with statutory requirements, minimise process interruptions and reduce costs”**

## HSSE/SAFETY CASES

Risktec provides a comprehensive service for the production and presentation of all levels of Health, Safety, Security & Environmental (HSSE) case documentation for all major hazard industries, including civil nuclear, defence, oil & gas, chemical, and transport. Each HSSE case takes into account the unique requirements specific to the industry, and relevant legislation, regulations and corporate standards.

Our services cover:

- Co-ordination, planning, preparation and technical support for all aspects of the HSSE/safety case
- Hazard identification
- Deterministic and probabilistic assessment
- Modelling of fault and hazard conditions
- Frequency and consequence assessment
- Identification of operating limits and conditions
- Design substantiation
- Preparation of emergency plans
- Cost-benefit analysis and ALARP assessment
- Preparation of HSSE/safety case reports
- Roll-out, communication and training for HSSE/safety cases
- “Living” HSSE/safety cases

**“Our in-depth knowledge of regulatory requirements and international standards across many industries allows us to provide unparalleled insights, rational solutions and full compliance”**

## HSSE MANAGEMENT SYSTEMS

A Health, Safety, Security & Environmental (HSSE) management system provides the structured set of controls for managing HSSE in the business. An effective system helps personnel at all levels to understand the importance of specific risks, and delivers the processes to manage and control them.

Our experienced consultants provide a comprehensive range of management system services, including:

- Developing integrated HSSE Management Systems to international standards which balance HSSE and economic considerations
- Developing and integrating Process Safety Management (PSM) systems
- Translating HSSE requirements into operating documentation
- Developing and verifying competence assurance systems
- Developing change management systems
- Developing document management systems
- Conducting independent third-party system and conformance audits and reviews, including pre-certification audits for ISO 14001, 18001 and 9001
- Facilitating pragmatic and cost-effective, risk-based improvement strategies and programmes

**“Clients receive the benefits of our consultants’ practical experience in applying management techniques to identify, assess and implement effective policies and procedures to control risks, minimise loss and reduce costs”**



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## COMPETENCY MANAGEMENT

A robust Competency Management (CM) system that is fully aligned to business objectives will help provide appropriately skilled and qualified personnel. This improves resource planning and operational effectiveness, and demonstrates compliance with regulatory or industry requirements.

Risktec helps clients to look beyond satisfying minimum requirements by focusing on competence as a strategic tool. We analyse an organisation and design, develop and implement suitable CM systems, allowing alignment between operational and competency needs.

Our services include:

- Analysis of current arrangements against best practice competency standards
- Capture of competency requirements – organisational, team and personal
- Role and task analysis
- Competency assessment and training needs analysis
- HR system integration, personnel planning and optimisation
- Training management expertise

Where appropriate, we use the **SkillsXP** software tool to efficiently implement the CM solution.

**“Risktec has been at the leading edge of developing practical tools to support the growing demand for CM frameworks, tailored to suit individual business needs”**

## HUMAN FACTORS

The role of people is increasingly recognised as of paramount importance when assessing risks in many industries. Risktec provides a service based upon practical experience of human factors in industry and knowledge of current academic theory. Our focus is to help improve risk performance by minimising human and organisational errors and enhancing human performance.

Risktec’s approach integrates human factors throughout the life-cycle of projects and facilities. The approach ensures early resolution of human factors issues, thereby reducing downstream problems such as re-design and emerging technical constraints. Our services include:

- Human factors integration planning
- Early human factors analysis
- Task analysis
- Control room design and workplace ergonomics
- Workload analysis
- Development of procedures
- Working environment assessment
- Operability evaluation
- Maintainability evaluation
- Human reliability analysis
- Training needs analysis

Our structured approach to the application of human factors can be the key to the success of designing, assessing, implementing and managing equipment, environments, systems and organisations.

**“Risktec’s approach is to ensure that human factors effort is targeted towards practical applications where risk reduction benefits are most significant”**

## CULTURAL AND BEHAVIOURAL SAFETY IMPROVEMENT

Ultimately, effective risk control is the result of motivated and competent people working in an organised business. Traditional “command and control” attitudes have been found to be severely wanting in today’s fast changing business climate. What many organisations are seeking is a culture where risk management is an integral part of day-to-day operations.

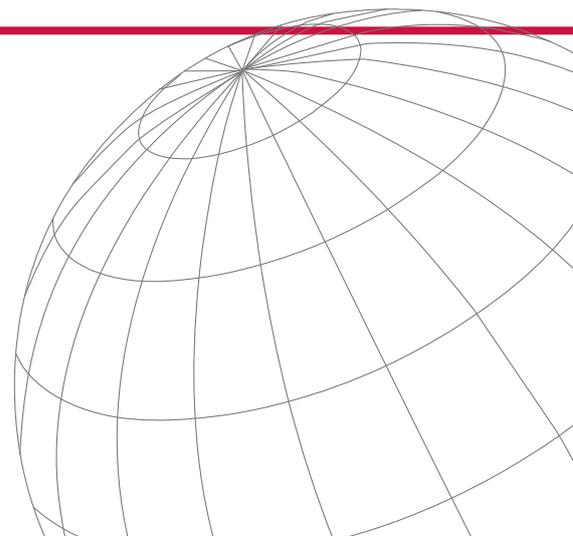
Risktec works with organisations to help them develop mature and “just” safety cultures, where people at all levels value positive safety behaviours and foster a desire for outstanding performance. Our services include:

- Behavioural safety strategy and programme development and associated support
- Safety culture/climate assessment and cultural change support
- Safety leadership workshops
- Behavioural safety and safety culture training, workshops and coaching
- Behavioural safety measurement
- Worksite risk assessment method development, linked to contractor management and safe systems of work
- Health and hygiene assessment
- Competency management system development
- Incident investigation and training

**“The experience of our consultants helps to accelerate cultural and behavioural improvement, and provides a solid foundation for building sustainable improvements in risk control”**



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## PROCESS SAFETY MANAGEMENT

The major objective of process safety management (PSM) is to prevent unwanted releases of hazardous chemicals, particularly in areas that could expose workers and the public to serious hazards. An effective PSM programme requires a systematic approach to identifying, evaluating and managing process hazards.

Risktec consultants are industry experts in PSM who share their practical experience and knowledge to provide clients with a pragmatic approach to PSM compliance.

Our PSM services include:

- Hazard assessments (HAZID, HAZOP, What-if?, Fault / Event Trees and Failure Mode and Effects Analysis)
- Layer of protection analysis (LOPA)
- Consequence analysis through dispersion, fire and explosion modelling
- Quantitative risk assessment
- Facility siting analysis
- Project process safety support
- Incident investigations
- Emergency response plans
- Compliance audits and training
- Human factors
- Management of change systems
- Contractor audits
- Security vulnerability assessments

Risktec has a unique blend of engineering and creative skills, proven methodologies and up-to-date analytical tools to address any PSM needs.

**"Risktec delivers solutions that are feasible, maintainable and cost effective"**

## BUSINESS CONTINUITY MANAGEMENT

An event such as a fire, loss of power, IT failure, supplier failure or terrorist attack can be a significant occurrence in the life of any organisation, directly affecting its ability to fulfil its business objectives.

Risktec provides an extensive range of Business Continuity Management (BCM) services to ensure that critical business activities, systems and processes can continue in the event of a major incident.

Our consultants have extensive experience in:

- Threat identification
- Business impact assessment and risk analysis
- Developing business continuity strategies
- Documenting business continuity plans
- Developing and documenting Business Continuity Management Systems (BCMS) to ISO 22301
- Delivering awareness and training programmes
- Business continuity plan auditing and pre-certification audits
- Facilitating tests and exercises of plans
- BCM training courses

We work with our clients to ensure that ownership for managing identified risks is firmly embedded within the client organisation.

**"Our approach to BCM focuses on the threats which present the greatest risk to the business, not just the worst-case impact, as is often the case with conventional approaches"**

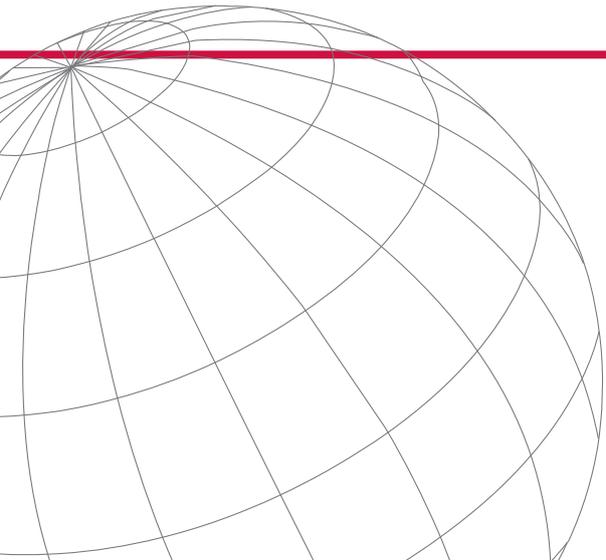
## ENVIRONMENTAL MANAGEMENT

Risktec delivers a wide range of services for the systematic identification, evaluation and control of risks to the environment. Clients receive the benefit of our consultants' ability to identify, assess and implement effective management and operational controls to mitigate environmental impacts, minimise waste and increase efficiency.

This embraces:

- Developing Environmental Management Systems to ISO 14001, which achieve sustainable development and minimise socio-economic impact
- Developing Environmental Performance Evaluation systems to ISO 14031, to deliver reliable and verifiable information
- Developing environmental aspects registers
- Identifying environmental-critical elements and developing performance standards and verification schemes
- Identifying best environmental practice
- Conducting third-party audits
- Analysing environmental risk for company activities to reveal exposure to pollution liabilities
- Due diligence reviews of facilities involved in mergers and acquisitions
- Contingency planning for an effective response to major environmental risks

**"Our approach facilitates a clear understanding of how environmental impacts will be managed during operations"**





## SECURITY RISK MANAGEMENT

Many large companies are finding their facilities, operations and sensitive information is under increasing security threat, whether located in developing countries or Western urban centres. As a result, identifying and protecting against such threats as political instability, bomb alerts, natural disasters and information disruption, is a priority for many organisations.

Risktec helps organisations to identify, understand, assess and manage their security risks. Our systematic yet flexible approach develops a comprehensive security plan, covering physical and procedural defences.

Our services encompass:

- Due diligence for acquisitions, mergers and business ventures
- Security risk analysis for operations, including using 'bowties' to identify deterrent, prevention, detection and mitigation controls
- Developing security management strategies and response plans
- Developing security awareness and training programmes
- Security audits and reviews, including information security audits to ISO 27001
- Investigation of security incidents
- Marine and port audits, assessments, plans, drills and exercises, and training to international security standards

**"Our risk-based approach to security management enables resources to be focused where they are most needed"**

## BUSINESS RISK ASSESSMENT

We work with our clients to identify major risk exposures and evaluate their relative significance to predict the total risk profile of the business. This includes property, safety, environmental, and any consequential business interruption and damage to reputation or asset.

Our consultants are specialists in:

- Facilitating structured and interactive workshops to identify and rank major risks
- Quantifying the probability, impact and uncertainty of major risk exposures, especially infrequent but high impact events
- Identifying risk controls, assessing their effectiveness, and recommending practical and cost-beneficial risk reduction improvements
- Due diligence studies to identify risk exposures and develop and implement plans for management control
- Technical risk analysis to advise on the optimum structure and levels of a risk financing programme

Our process enables us to evaluate both 'company breakers' and more likely scenarios to provide a baseline for management action and risk financing decisions.

Our consultants emphasise that a risk is never actually reduced until a change is fully implemented and proven to be effective.

**"We recommend solutions based on a solid foundation of engineering, scientific and technological knowledge not found at traditional risk management companies"**

## INDEPENDENT REVIEW

Risktec is regularly engaged by facility owners and operators, equipment suppliers and insurers, in many industries, to provide independent review. Our services include:

- Developing assessment and audit strategies
- Desktop technical assessments, peer reviews and site audits
- Identifying technical weaknesses
- Identifying where practices deviate from procedures
- Identifying conflicting attitudes at different organisational levels
- Ranking identified risk exposures
- Developing plans for improved management control
- Supporting implementation

**"We take a pragmatic view of independent review work by 'stepping back' and looking at the big picture, homing-in on any key areas of risk"**

## SPECIALIST SERVICES

Our specialist services enhance our core services, providing a complete solution. These are normally provided in-house, but we also draw on external specialists or work jointly with strategic alliance partners. Services include:

- Auditing
- Business performance improvement
- Change management
- Environmental impact assessment
- Fire protection
- Health risk assessment
- Incident investigation
- Natural hazards risk assessment
- Organisational design
- Project risk management
- Radiological protection
- Research and technology
- Structural integrity and analysis

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