

## MANAGING RISK COMPETENCE†

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This paper will explore what constitutes Risk Competence, and how organisations can manage it to ensure the appropriate risk behaviour of its people and improve process safety and environmental performance. Risk Competence includes the knowledge and skills required to identify and control hazards in the workplace, however it is important to look beyond the technical aspects of competence to include the psychological aspects which effect behaviour. How can organisation's ensure people perceive risks correctly, have appropriate values, beliefs and attitudes concerning risk, and commit to relevant norms and rules?

### 1. INTRODUCTION

Process industry today is under increased scrutiny concerning its process safety and environmental performance. Process industry managers know the dangers of getting process safety management wrong and that the bigger their companies are the more exposed they are. A major challenge facing process companies today is how to improve and demonstrate process safety and environmental performance through more effective risk management.

The process safety and environmental performance of an organisation is only as good as its employees. This paper will explore the following questions:

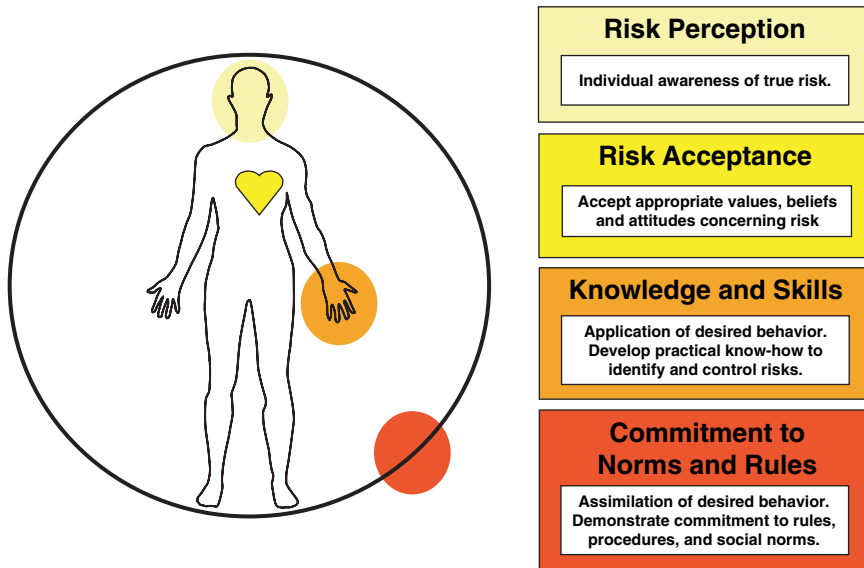
- What is Risk Competence?
- How can Risk Competence of employees and contractors be evaluated?
- How can Risk Competence of employees and contractors be developed to improve process safety and environmental protection?

We will address these questions by reference to a new model of Risk Competence and explore how it can be applied systematically to improve process safety and environmental protection.

### 2. WHAT IS RISK COMPETENCE?

The behaviour of young children, driven by curiosity and a need for excitement, yet curbed by their sense of danger, is risk management in action. Learning to walk or ride a bicycle

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**Figure 1.** DNV Risk Competence model

cannot be done without accidents. In mastering such skills children are not seeking a zero-risk life; they are balancing the expected rewards of their actions against the perceived costs of failure.

We are all risk managers. Driving a car involves a high degree of risk evaluation and risk control. Crossing a busy road, competing in sports, carrying out home improvements, bringing up children, buying a house, travelling overseas, choosing a restaurant and making career moves are all activities involving degrees of risk we must evaluate and control. How do you go about managing complex risk issues such as these? Do you make the right risk decisions? Are you Risk Competent?

Drawing together psychological research on the risk behaviour of individuals, DNV has developed a new model of Risk Competence. Risk Competence may be defined as “an individual’s risk perception, risk acceptance, knowledge and commitment to norms to be able to correctly identify and control the risks they are exposed to.”

The Risk Competence model is shown in Figure 1 and its four elements are described in greater detail below.

**RISK PERCEPTION**

Risk may be defined as “the combination of the probability of an event and its consequence’ (ISO/IEC Guide 73). This definition suggests that there is a true or objective risk

**Table 1.** Characteristics influencing whether events are perceived as “Safe” or “Risky”

“Safe”		“Risky”
Voluntary	vs	Coerced
Natural	vs	Industrial
Familiar	vs	Exotic
Not memorable	vs	Memorable
Not dreaded	vs	Dreaded
Chronic	vs	Catastrophic
Knowable	vs	Unknowable
Individually controlled	vs	Controlled by others
Fair	vs	Unfair
Morally irrelevant	vs	Morally relevant
Trustworthy sources	vs	Untrustworthy source
Responsive process	vs	Unresponsive process

associated with all events which can be calculated if one knows the probability of an event and its consequences. However, as individuals we are rarely in a position to calculate the true risk of an event. Rather we rely on our perception of risk to determine our behaviour.

As individuals we perceive the risks associated with activities differently and these perceptions are often very different to the true or objective risks. Often there is an inverse relation between our risk perception and the true risk. For example; people are afraid of flying and are happy to go by car, when the true risks indicate the opposite. People are most worried about their safety in the workplace and feel safer at home when the true risks are often the opposite – when did you last have an accident – was it at work or away from work? Most people’s accidents occur doing sports or home improvement projects. In other words the things people are worried about and the things that actually hurt them are often inverted. This is a problem of Risk Perception.

Peter Sandman (1993) identifies 12 characteristics of events in Table 1 that influence whether an individual perceives an event as “safe” or “risky”. Top of the list is whether the event is voluntary or coerced. For example the safety risk of a person parachuting from a plane voluntarily will be considered lower, compared to if they are pushed! If the event is natural or industrial is also important e.g. the objective health risk of radioactivity from a modern nuclear power station is far lower than for radon gas rising naturally in Cornwall in South West United Kingdom. However the public and media risk perception of getting cancer from nuclear power stations is far higher than for living in Cornwall<sup>1</sup>.

<sup>1</sup>Radon is estimated to be responsible for 2500 deaths from lung cancer in Britain per year according to the UK Department of the Environment, British Medical Journal, May 1996.

Risk perception is important because it strongly influences risk decision making. Poor risk perception leads to poor risk decision making. In addition, employees, contractors, managers, regulators, the public, pressure groups and the media often perceive the risks of the same event very differently, which creates daily conflicts we read about in our newspapers.

Risk perceptions are deeply held by individuals and are difficult to change. Changing risk perception is best achieved through direct involvement of stakeholders and effective two way risk communication.

## RISK ACCEPTANCE

Once we have perceived a risk, we then make conscious or unconscious decisions about its acceptance. This decision process means evaluating the risk against our personal risk acceptance levels. We may be aware for example that drinking cola increases the risk of putting on weight and diabetes and that smoking increases the risk of lung cancer. But do we accept these risks and change our behaviour? We may decide to accept the risk of drinking cola but not the risk of smoking indicating different levels of risk acceptance for these two risks.

Risk acceptance then refers to the behaviour of a person in a situation of uncertainty to engage in a certain behaviour or not to engage in it, after weighing up the estimated benefits against the costs.

Risk Acceptance is represented in the Risk Competence model as the “heart” because these are largely unconscious decisions guided by our values, beliefs and attitudes concerning risk. For example an individual may believe they are an excellent car driver which may then influence their decision to drive faster than the speed limit. Young people often have the belief they are invulnerable and accidents only happen to other people and so are more likely to accept the risks of drinking and driving. Behaviours that we do habitually can change our attitudes to risk and alter our risk acceptance, for example regularly driving at speed in traffic. If a person is a “sensations seeker” they value taking risks and will accept higher levels of risk than a person who is risk averse. Such people will engage in higher risk activities like skiing and motorbike riding. In a working context such people may not follow procedures and rules because they believe the rules are intended for other less competent people.

In the workplace, we would like individuals to adopt appropriate values, beliefs and attitudes concerning the risk they are exposed to. Only then will they make the correct risk decisions and desired risk behaviour.

## KNOWLEDGE AND SKILLS

Competence in the workplace may be defined as “the knowledge, skills and attitudes to correctly perform a specific role.” To be risk competent, individuals must have the knowledge and skills to correctly identify, evaluate, control and monitor the risks they are exposed to. These skills may include technical knowledge of the risks they are exposed to

e.g. knowledge of how to handle hazardous chemicals. Necessary knowledge and skills may include the know how to conduct an effective hazard identification process, use a risk assessment matrix or knowledge of site rules and procedures.

Knowledge and skills are developed through education and training programs, coaching and experience on-the-job. The application of desired risk behaviour demonstrates and reinforces these knowledge and skills.

#### COMMITMENT TO NORMS AND RULES

Laws, rules, procedures, practices, conventions and norms exist at all levels of society. These norms and rules exist to safeguard against risks. For example, regulations protect the health and safety of employees in the workplace and stop company's damaging the environment. Company rules and procedures ensure quality product is delivered to the customer.

By complying with norms and rules individuals are protected from risk without always having to recognise the risks they are faced with. For example one can drive safely on unfamiliar roads by relying on the road traffic signs and knowledge of the highway code.

The extent to which individuals are committed to consistently apply rules and norms is the final component of risk competence. When compliance with rules and norms becomes habitual we can say that individuals have assimilated the desired behaviour.

### **3. HOW CAN RISK COMPETENCE BE EVALUATED?**

The Risk Competence model may be used to evaluate the Risk Competence of individuals with respect to a particular task. For example is an employee Risk Competent to operate particular process plant. DNV have developed facilitated workshop methodology whereby the work team for a specific process area are guided through the Risk Competence model and evaluate as "go" or "no go" the Risk Perception, Risk Acceptance, Knowledge and Skills and Commitment to Norms and Rules of the team to complete critical tasks.

Any "no go" issues are captured and improvement actions identified.

### **4. HOW CAN RISK COMPETENCE BE DEVELOPED TO IMPROVE PROCESS SAFETY AND ENVIRONMENTAL PROTECTION?**

Based on the research by leading psychologist Bandura (2000), we propose that the Risk Behaviour of individuals is function of two variables; Risk Competence and the External Environment. Risk Competence is made up of the four characteristics reviewed above. External Environment is made up of many factors including the management system and working environment. Risk Behaviour in turn influences the Risk Competence and the External Environment. These interrelations are represented in Figure 2.

This model may be used to improve the process safety and environmental performance of process plants. The model proposes that to improve process safety behaviour of individuals in process areas we must do two things. Firstly we should improve the External

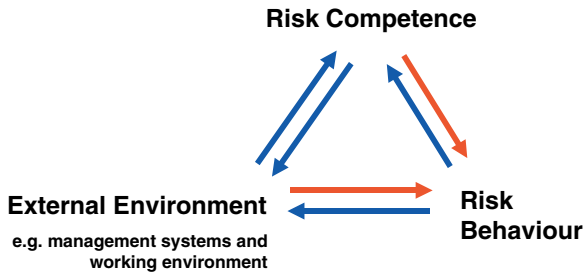


Figure 2. Influences on Risk Behaviour

Environment in which the individuals operate. The design of process plant should be correct to support the correct process safety behaviour, the procedures, practices and norms should also direct the correct behaviour. Secondly individuals should have the correct Risk Competence. They should have a good awareness of the true risks of the process hazards they face. They should accept the appropriate values, beliefs and attitudes necessary to manage those hazards and make the correct risk based decisions. They should have the

Management System Activity	Risk Perception	Risk acceptance	Knowledge & Skills	Commitment to norms and rules
Leadership	Stakeholder engagement, communication	Lead by example, management tours, recognition, motivation	Communication, coaching	Set expectations/ vision/values
Risk Recognition and Risk Evaluation	Point of work risk assessment	Group risk assessment, Team working	Training, Learning by doing	Learning by doing
Human Resources	Work-life-balance	Effective recruitment	Effective recruitment, set responsibilities	Effective recruitment, performance review
Training and Competence	Knowledge and skill training	Induction	Knowledge and skill training	Refresher training
Communication	Promotion campaigns	Group meetings, teambuilding	Risk communication	Coaching
Risk Control	Participation in work place design	Participation in developing rules	Learning by doing	Learning by doing
Maintenance and Inspections	Tours	Inspections	Coaching	Review meetings
Contractor Management	Participation	Contractor Forums	Contracting	Feedback loops
Emergency Preparedness	Emergency scenario analysis	Participation in Emergency teams	Training	Exercises, drills
Risk Monitoring	Participation	Perceptions surveys	Learning by doing	Task and behaviour observation, audits
Results and Review	Performance review	Business review	Reporting	Management review

Figure 3. System activities to develop Risk Competence examples

necessary technical knowledge and skills to evaluate and control process risks. Finally, they should demonstrate their commitment to the rules, procedures and social norms the company has put in place for process safety.

A systems approach is the only effective approach to manage the complexity associated with improving process safety Risk Competence. Figure 3 shows a menu of example management system activities which can be applied as required to improve the process safety risk competence of individuals leading to improved process safety and environmental protection.

## **5. CONCLUSIONS**

This paper has introduced a model of Risk Competence, suggested a method to evaluate it and proposed how it may be used to improve process safety and environmental performance.

We suggest that achieving the necessary levels of Risk Competence among employees and contractors working in process areas will result in improved risk decision making and risk behaviour. In combination with other approaches, this can be used to improve process safety performance and reduce the risk of major accidents.

## **6. REFERENCES**

- Bandura A., 2000, Self Efficacy: The Exercise of Control, WH Freeman and Co. NY  
Sandman P., 1993, Responding to Community Outrage: Strategies for Effective Risk Communication, American Industrial Hygiene Association