

RISK BASED INSPECTIONS

The essential team members and skills you need to implement RBI effectively



**BRITISH
ENGINEERING
SERVICES**



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■ INTRODUCTION



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In the past, organisations have traditionally inspected plants at fixed intervals. While a good precautionary undertaking, this approach doesn't take account of good operating experience, or allow resources to be correctly allocated to the areas of greatest risk.

In more recent times, there have been changes in approach. Sectors such as the petrochemical and refining industries have increasingly adopted a Risk Based Inspection (RBI) approach that allows them to focus inspection resources where they are most likely to be needed. This can enable sites to extend inspection intervals and reduce plant shutdown periods, saving considerable amounts in increased production.

In order to be able to move away from a fixed inspection method, legislation such as the Pressure Systems Safety Regulations 2000 requires organisations to ensure that RBI achieves an equivalent level of safety.

If implemented correctly, an RBI approach can improve asset integrity management, as well as increase the organisation's efficiency, while reducing plant downtime and increasing income.

In order to successfully achieve these goals, it is essential that you have the right team members and skills in place. Our guide takes you through the RBI team selection process, setting out:

- The importance of selecting a multi-disciplined team that draws on both internal and external strengths and expertise
- The essential team members you require for RBI
- What skills, experience and qualifications each team member should have
- A case study on how a major chemical company implemented RBI successfully, improving safety and saved €10 million in the process.

■ THE IMPORTANCE OF SELECTING A MULTI-DISCIPLINED TEAM

For thorough risk analysis and inspection planning, it is necessary to have a multi-disciplined team that can provide the correct expertise and skills for specific areas of the RBI process.

Core competencies

The team should include competency across the following areas:

- Risk analysis and assessment
- Operations
- Production processes and hazards
- Failure probability and consequences (mechanical and processes)
- Knowledge of the plant's maintenance and inspection history, degradation encountered and existing maintenance routines
- Inspection methods
- Mechanical engineering, including materials chemistry and structural design
- Non-destructive testing (NDT) methods and procedures
- Metallurgy.

For RBI to work effectively, it is best to utilise both internal and external resources

Internal resources should have an in-depth knowledge of existing processes and specific plant and equipment. External resources can help to ensure that this knowledge is supplemented by wider engineering practice and developments. This is particularly important for the analysis and assessment of the risks of failure, where the perception of risk is a relative judgement instead of an absolute one.

Identify internal and external strengths and weaknesses

Prior to commencing the RBI process, companies should undertake an analysis of their internal and external strengths & weaknesses to determine who can add the most value to each part of the process.

Maintain independence between operations and inspections/testing

It is also important to ensure that independence between operating functions and inspections/testing areas is maintained during the process. Sometimes, for larger organisations that undertake both functions in-house, it may be possible to achieve this. This, however, can often prove difficult for small and medium sized companies.



Check accreditations and qualifications

It is important that both internal and external resources have the necessary experience and qualifications to demonstrate competency for their roles, e.g. PCN Level 3 and the BS EN 15052 standard for NDT. This is further addressed under the specific team member roles.

If you are planning to use an external company for any aspect of inspection, you should ensure that they have the UKAS accreditation to BS EN ISO/IEC 17020 standard and have relevant experience in this area. The Chemical and Downstream Oil Industries Forum (CDOIF) has published guidance on this which can be found on the HSE website [here](#).

Ensure that all roles are clearly defined

For RBI to work effectively, it is important that each team member has a clearly defined role within the process and that responsibilities between internal and external resources are clearly outlined.



■ THE REQUIRED TEAM MEMBERS AND SKILLS

1



TEAM MEMBER FUNCTION 1: The Chairman

A Chairman should be appointed to guide and steer the RBI group through the process and reach agreed outcomes.

The Chairman should be sufficiently independent from the organisation's production operations to ensure that there is no conflict of interest. They should also have an in-depth knowledge of RBI, so that they can make correct and informed judgements, guiding the process from start to finish.

Organisations will typically appoint a Chairman from their engineering, technical or safety department. They will have a breadth of knowledge of the plant in order to meet the information-finding requirements for risk analysis. However, where there is insufficient experience in-house, they may appoint someone from an external organisation to fulfil this role.

The Chairman

Typical years of experience in RBI: 5

Qualifications: Typically a Chartered Engineer in a discipline relevant to the RBI process e.g. Mechanical Engineering or Chemical Engineering.



■ THE REQUIRED TEAM MEMBERS AND SKILLS

2

**MECHANICAL
ENGINEER**
(Site and External)



TEAM MEMBER FUNCTION 2: Mechanical Engineer (Site and External)

The site's Mechanical Engineer can provide an experienced insight into the plant's operation, maintenance & inspection history, degradation encountered and existing maintenance routines. However, an external Mechanical Engineer can provide the required mechanical engineering expertise of the RBI process, drawing on their wider industrial expertise to advise on degradation mechanisms, likely frequency of equipment failures and an appreciation of how hazards & accidents may arise in any given scenario.

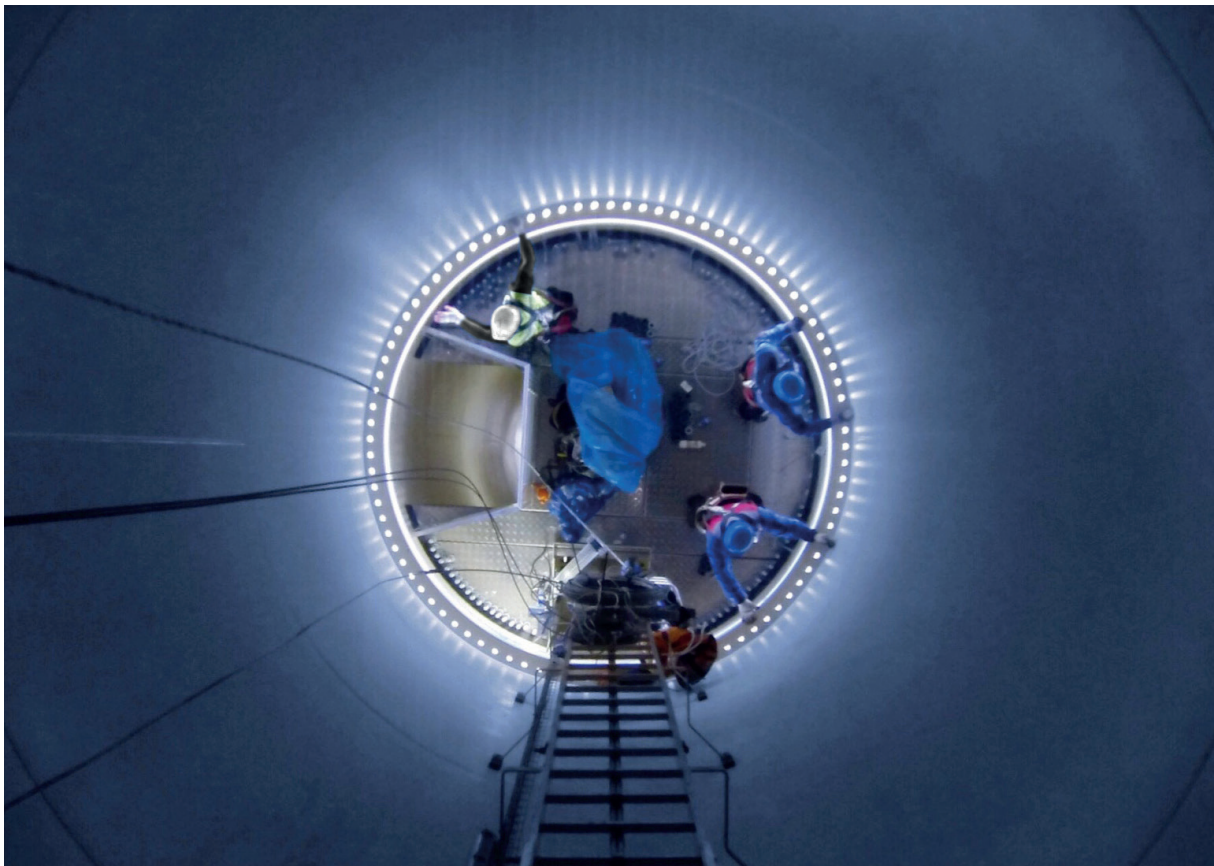
Site Mechanical Engineer

Typical years of experience: 5

External Mechanical Engineer

Typical years of experience: 5

Qualifications: Typically a Chartered Mechanical Engineer.



■ THE REQUIRED TEAM MEMBERS AND SKILLS

3

**PROCESS SAFETY
ENGINEER**
(Site and External)



TEAM MEMBER FUNCTION 3: Process Safety Engineer (Site and External)

It is important that the RBI team consists of those with a thorough understanding of existing plant production processes, process hazards and the consequences of failure.

A Site Process Safety Engineer can provide the in-depth knowledge of the plant's equipment process, protection systems, process hazard reviews and process hazard management procedures. This is complemented by an external Process Safety Engineer, who can interrogate the site's systems and safety processes and use their wider industry experience to determine the likelihood and consequences of failure.

Site Process Safety Engineer

Typical years of experience: 5

External Process Safety Engineer

Typical years of experience: 5

Qualifications: Typically a Chartered Chemical Engineer or equivalent.



■ THE REQUIRED TEAM MEMBERS AND SKILLS

4

**DAMAGE
MECHANISMS**
(Non-Destructive Testing
and Metallurgy)



TEAM MEMBER FUNCTION 4: Damage Mechanisms (Non-Destructive Testing and Metallurgy)

Under an RBI approach, NDT should be targeted at the high/medium risk items that have been identified as part of the risk analysis and assessment, in order to reduce the probability of failure and risk.

When moving from a fixed interval approach to an RBI approach it is even more important that:

- the correct NDT technique is used
- to identify the damage mechanism
- it is correctly applied
- its capabilities and limitations are understood
- the findings are then fed back into the RBI process.

Metallurgy expertise underpins the understanding of the formation of metal & alloys defects and often specific metallurgical skills and experience are needed in addition to NDT.

Whilst NDT and metallurgy competence can be provided by either internal or external expertise, in most cases, only external experts will have the required degree of experience and wide industrial knowledge to inform the process.

It may not be necessary that either the NDT or metallurgical experts attend all of the RBI meeting sessions, but it is important that the team has access to this expertise as and when required.

Non-destructive testing

Typical years of experience: 5

Qualifications: PCN Level 3 in testing disciplines relevant to any proposed inspection technique and certification to BS EN ISO 9712 standard

Metallurgists

Typical years of experience: 5

Qualifications: Typically a Chartered Materials Engineer.

■ CASE STUDY

€10m

How a major chemical company implemented RBI successfully, improved safety and saved €10 million in the process.

In supporting a major chemical company, British Engineering Services provided an RBI framework in accordance with the Health & Safety Guidance document “Best practice for risk based inspection as a part of plant integrity management”, Contract Research Report 363/2001. This was applied to a site with over 350 items.



We carried out a review of the entire site prior to a major shut down, utilising a team of both mechanical and process engineers from our customer and British Engineering Services staff. The output from the review resulted in a more targeted inspection regime, as well as extending the outage frequency from 3 years to 5 years. The inspection regime targeted the damage mechanisms in a more systematic way, the resulting frequency enabled our customer to realise a €10m saving on their shutdown costs over a 15 year period.

In this particular case, a top tier COMAH site, the Chairman for the review was provided by ourselves and is a Chartered Engineer. The team also consisted of:

- the site's Materials/Inspection Engineer, who had 20+ years of experience in inspection and failure analysis on the site
- the site's Process Engineers, who were responsible for operating the plant and gave an insight into the process and any upset conditions

We also provided a Chartered Chemical Engineer who has expertise in process safety to interrogate the process and issues that would impact the aging and inspection of the plant

When it was required, British Engineering Services provided expertise on NDT techniques and their application.



■ NEXT STEPS

Once you have identified your internal strengths and weaknesses, it is essential that you pick the right external expertise to supplement your skills and knowledge.

At British Engineering Services our focus puts you, the customer, first. Our expert team of experienced Engineer Surveyors, with industry-leading accreditations, can help you with all aspects of RBI. We have worked with over 30 companies on RBI services and, as our case study above shows, we can help achieve real safety improvements, as well as financial and resource savings.

To find out more, speak to one of our Risk Based Inspection experts today.





MEET HSE TARGETS AND ACHIEVE COST SAVINGS WITH RBI

‘Second to none’ expertise in Risk Based Inspections can optimise the cost of complying with statutory obligations for Health & Safety and enable you to manage the risk of failure to an acceptable level.

**SEE WHAT YOU COULD ACHIEVE.
GET AN RBI QUOTE.**

British Engineering Services, 5 New York Street, Manchester M1 4JB
T 0345 678 2985 E info@briteng.co.uk W britishengineeringservices.co.uk