Risk Based Inspection (RBI) solutions

Improve integrity, reduce costs through more effective inspection
Risk Based Inspection (RBI)

What is RBI?

RBI is a well proven approach for determining the optimum inspection plan for plant equipment. It uses a risk-based methodology to reduce risk, improve efficiency and lower the total costs of inspection.

RBI has proven to be an effective tool for the optimisation of inspection strategies for vessels (columns, heat exchangers, filters, boilers, furnaces etc.), storage tanks, pipework, relief streams, civil structures, sumps and bunds.

Benefits of RBI
- Reduced likelihood of loss of containment
- Reduced inspection cost by specification of appropriate inspection techniques and extending inspection intervals where appropriate
- Improved reliability and plant availability
- Legislative compliance

How to select an appropriate RBI methodology

RBI methodologies

Across industry there are two different approaches to RBI: qualitative and quantitative.

The quantitative approach
A highly data driven methodology that is focused upon theoretical corrosion rates. The assessment calculates the remaining safe operating life of the equipment and the output is typically in numerical form, without visible analysis or action plans. The adoption of this approach can limit the benefits of RBI because:

- Operating excursions or cleaning routines are not considered
- Inspection data is not always available or validated
- Corrosion rates are not verified
- Written Schemes of Examination (WSE) are not updated

The qualitative approach
A more holistic view to determine what to inspect, where, how and when. It identifies the actual operating and maintenance conditions for the assessed equipment, including upset and start-up / shutdown conditions. It delivers an auditable risk assessment that enables the generation of a WSE that will optimise plant availability, reduce costs and improve equipment integrity. ABB’s RBI+© programme uses a qualitative team-based methodology and unique software to ensure that the full benefits from RBI are realised.
Our experience
ABB provides technical and engineering services to improve performance in the areas of compliance, operations and engineering to customers in the chemical, petrochemical, oil and gas, power, pharmaceutical, metals and customer industries worldwide.

ABB has over 20 years experience of carrying out RBI reviews and has applied the RBI+© methodology to over 100,000 equipment items. Our operating history and functional expertise enables us to provide authoritative advice and solutions across the range of our clients' assets (gives us the leading edge capability across all assets).

Which items should we review? Where do we start?
ABB offers an initial 'criticality and opportunity screening process' which assesses the likelihood and consequence of equipment failure and the cost effectiveness of the current inspection regime. This enables equipment to be ranked in order of criticality or by the size of opportunity for improvement.

Normally no further study of low ranking equipment is necessary, enabling resources to be targeted to areas that will benefit the most. It is also an effective way of recording and demonstrating that all items have been assessed for both Health Safety and Environment (HSE) and business risk and comply with the relevant legislation.

RBI+© methodology
Items benefiting from a full RBI study are then assessed by a multi-discipline team using ABB’s RBI+© methodology. A fundamental part of ABB’s process is a collaborative review involving the client’s operations and maintenance personnel assisted and lead by ABB’s functional specialists (by operations, maintenance and functional specialists from ABB and client teams).

The key steps of the process are:
- Gathering operating conditions and inspection history data
- Team review of data
- Identification of credible deterioration mechanisms
- Analysis of HSE and business risks
- Determination of the optimum inspection plan.
  The rationale for the proposed inspection strategy is recorded
- Generation of a WSE for each item under consideration
- Review as new data becomes available

The RBI+© methodology is compliant with API 580 RBI.
RBI+© methodology - the benefits

The benefits of RBI+© compared to other methodologies:
- Data used is specific to each item and validated
- Actual operating conditions are understood and assessed, displacing conservative assumptions or occasionally over-optimistic assumptions
- Expert knowledge is engaged to determine credible deterioration mechanisms
- Team ownership of risk assessment and inspection strategies
- Auditable rationale for the extension of inspection intervals and the adoption of non-intrusive inspection strategies
- End product is a Written Scheme of Examination unique to each item
- Increased confidence in equipment integrity

In most cases, a program of RBI+© reviews will deliver a significant reduction in the total cost of inspection.

Benefits of RBI+© to a new client over a three year period.

<table>
<thead>
<tr>
<th></th>
<th>Before RBI</th>
<th>After RBI</th>
<th>Inspection cost before RBI</th>
<th>Inspection cost after RBI</th>
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</thead>
<tbody>
<tr>
<td>Average inspection</td>
<td>53.4 months</td>
<td>79.2 months</td>
<td></td>
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<tr>
<td>Interval</td>
<td></td>
<td></td>
<td>£1,359,000</td>
<td>£657,000</td>
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<tr>
<td>Invasive inspection</td>
<td>151</td>
<td>73</td>
<td>£1,359,000</td>
<td>£657,000</td>
</tr>
<tr>
<td>Non-invasive</td>
<td>124</td>
<td>202</td>
<td>£186,000</td>
<td>£303,000</td>
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<tr>
<td>Inspection</td>
<td></td>
<td></td>
<td>£1,545,000</td>
<td>£960,000</td>
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<tr>
<td>TOTALS</td>
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<tr>
<td>SAVING compared to</td>
<td>£585,000</td>
<td></td>
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<td>traditional inspection</td>
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Cost savings above do not include any benefits due to the increase in plant intervals or benefits of risk reduction

“After applying RBI+©, I now have a greater understanding of my plant equipment and total confidence in my inspection and operating policy.”

Plant Engineer, Major Hazard Chemical Installation

“We have used ABB Inspection Services since August 2005 following a long period (since 1970) during which we provided our own inspection team. It was immediately obvious that ABB brought a number of advantages to the table”

Ammonia Mechanical Engineer, CF Fertilisers UK Limited
**RBI+© software**

**Enhancement of RBI+© pRIME tool**

All RBI reviews undertaken by ABB have been delivered using the RBI+© pRIME (process Reliability and Integrity Management Excellence) tool enabling an efficient and robust assessment process. This software has now been further enhanced and is available for license as a standalone tool. Consequently, clients are now able to complete RBI reviews in-house effectively and efficiently according to ABB’s recognised methodology.

In addition to the existing benefits of ABB’s RBI+© methodology the enhanced tool offers:

- More efficient RBI studies, using less operating team time
- Access to a large knowledge bank of best practice guidance and equipment inspection data

**pRIME toolkit**

The RBI+© software is one element of ABB’s pRIME toolkit. pRIME is a methodology for managing asset integrity; recognising symptoms, diagnosing causes, and implementing corrective or improvement action. Adoption of the pRIME methodology will deliver a beneficial, cost effective, sustainable solution. All processes are risk based, ensuring that effort is concentrated on areas that will give the highest return.

**Key features of the software**

- **Deployable via web, intranet and Lotus Notes**
  The software can be accessed in various ways depending on client and project requirements.

- **Secure**
  The application is secured using tiered access, meaning that access and edit permissions can be set person by person, module, by module. Data is secured through encryption.

- **Access from anywhere**
  The application can be accessed through a web browser or by using a local copy from the users PC.

- **Data capturing and review**
  Several team members can work concurrently in capturing the input data electronically to enable review during multi-disciplinary meetings. Data from the different team members is transmitted through client and browser based applications and aggregated allowing individuals to work separately. This allows the information to be reviewed by specialist engineers outside of the immediate project team.

- **Corrosion loops**
  The software enables similar items of equipment with similar operating conditions and deterioration mechanisms to be grouped together to form what are sometimes called corrosion loops. This ensures that a range of and changes in process conditions are considered consistently across the complete series of equipment affected. This also minimises the input requirements.

- **Consistent workflow and management reporting**
  Each equipment item review is subject to a series of secure stage gates to ensure that all of the necessary input data has been collected, analysed and the recommendations captured. This structured work process facilitates the tracking and reporting of project status by means of the progress dashboards.

- **Risk assessment according to client’s criteria**
  The assessment criteria for likelihood and HSE and business consequences are configurable to the client’s own risk assessment criteria.

- **Automated generation of reports**
  Summary and detailed reports of each RBI review project program can be created in Word and Excel. The format of these reports is configurable in the field on a project by project basis.

- **Portfolios**
  Standard templates are available for each sector - oil and gas, refinery, petrochemical, pharmaceutical and power. These templates prompt assessment of relevant deterioration mechanisms for each sector.

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To see how RBI+© pRIME software can benefit your business try our free demo at: www.prime-toolkit.com
Training
ABB can provide training on the RBI process and how to get the most out of the RBI+© tool. We can provide bespoke training onsite or at our offices.

Support
The software is easy to use. Our in-depth help guides will provide the answers to most queries and ‘how to’ videos will guide you through the process. In addition, we offer free support via telephone and email service.

Technical specification
- Compatible with Internet Explorer, Google Chrome and Firefox
- Compatible with IBM Notes
- Compatible with Microsoft Word and Excel
- Ability to produce custom detailed reports and charts
- Includes selective replication functionality
- Can be installed on our servers or client servers
- Available as a secure web based Software as a Service (SaaS) application
- Available as an On-premises install or virtual appliance
- Available as a locally installed client solution with optional cloud synchronisation

*On premises options also available
RBI is one element of ABB’s integrity management offering.

We can provide integrity management support throughout the plant life cycle.

ABB inspection services
- Pressure equipment specification and design
- Independent design review
- RBI+©
- UKAS accredited inspection service
- Preparation of focussed schemes of examination
- Fitness for purpose assessment
- Repair specification
- Materials engineering and consultancy
- Civil and structural inspection and consultancy
- Auditing and gap analysis against PSSR, PUWER
- Asset life studies and plans

Integrity management services
- Asset health check
- Asset life studies
- Technical Due Diligence (TDD) assessment
- Risk based approaches embracing safety, maintenance, criticality and inspection
- Competency and development training and appreciation programmes
- Integrity management solutions software

Other ABB capabilities
- Inspection
- Operations improvement
- Process safety
- Project services
- Technical engineering
- Technical software
- Technical training and competency