An inspector calls

New risk-based assurance stance for Hull

Plant inspections can be troublesome processes—time consuming and costly. But a new risk based assurance strategy could help trim the expense and maintain safety standards, writes **Helen Campbell**

BP CHEMICALS' Hull site, one of the UK's biggest chemical complexes and Europe's largest single producer of acetic acid, has implemented a new risk based integrity assurance approach to ensure better understanding of plant and equipment vulnerabilities and enhance safety and plant performance.

The approach began in 2001 with a pilot as part of the wider maintenance breakthrough initiative, before being developed as a project in 2002.

After much success, this assurance process—which uses a risk matrix to assess the optimum inspection time for each specific piece of plant equipment—has been fully embedded into normal site practice at Hull and has become site culture for verifying equipment integrity.

Risk-based integrity assurance, a step on from traditional prescriptive time-based methods, analyses equipment risk profiles to allow the user to manage and reduce potential risks—in other words, instead of inspecting equipment for the sake of it annually, for example, the new system pinpoints the optimum inspection cycle based on the equipment's age, the impact of any malfunction, the chance of a part becoming worn and the time since its last inspection.

Risk-based inspection (RBI) forms a major part of this process, consisting of an optimized inspection plan and other mitigating strategies derived from detailed assessments of each equipment item and its damage mechanisms.

Apart from the obvious commercial benefits of optimizing equipment inspection interval and plant run time, some of RBI's other benefits include fewer vessel entries and fewer plant start-ups and shutdowns–such events mean statistically higher health and safety risks.

RBI is a developing technology and has been applied in many different ways, initially to the oil and gas exploration sector, with the refining and chemical industry having generally taken the technology up later, and with some sectors still doing so.

The diverse metallurgy, various corrosion and other damage mechanisms applicable to many of the plant items at Hull meant the chosen RBI assurance methodology had to be up to the task technically.

"The concern was that if these issues and other best practice considerations associated with correct application of RBI technology were not comprehensively covered, then we would miss out on improvements to safety and reliability," says John Verdon-Smith, Hull site engineering integrity manager.

After a rigorous selection procedure, Hull awarded specialist RBI company, PP SIMTECH, the contract to provide the technology process and implementation support. This process included an innovative technology platform to reliably assess equipment risk profiles and ensure the resulting inspection interval and inspection plan are correctly optimized for each plant item.

Working in partnership, BP and PP SIMTECH have further developed the technology, culminating in an RBI driven integrity assurance process that now ensures the safety and reliability of plant items are improved and not compromised, while also achieving financial benefits.

"Even at the pilot stage, it was apparent this RBI assurance process offered a great opportunity to deliver both integrity and financial benefits to the BP Hull Site," says acetyls group engineer, Marc Reaney. "The multi-disciplinary teams involved in defining the process, then executing RBI reviews have done fantastic work and now we are realizing benefits beyond our initial expectations."

Don Cawthra: 'Work is only carried out when required, saving time, money and potential accidents. Summing up RBI's main impact is 'being in control'.'

One of the main outputs of the integrity assurance process is that it has delivered confidence in the optimized inspection interval for each plant item, while securing better definition for operating limits to prevent an increase in damage rates or initiation of new damage mechanisms. As a result, the process has got the backing of inspection engineers at site, and also of chemical and mechanical engineers in plant operations. This is essential to reliably manage RBI technology-based equipment integrity.

Optimized inspections: Trevor Turnbull, area inspection engineer, says: "The most important part for me from this RBI system is that all active and potential damage mechanisms are identified on an individual item basis, and the optimized inspection requirements are clearly defined for each."

Turnbull's view is echoed by Don Cawthra, development engineer from the manufacturing team at Hull.

He says: "The RBI assurance process allows the optimum inspection interval and operational limits to be determined using all the known data.

"This means work is only carried out when required, saving time, money, and, more importantly, potential accidents. It also means that environmental performance can be improved. Summing up, its main impact is 'being in control'."

The supporting software, rbiAsyst, has been used successfully since 2001 to facilitate and record the RBI study carried out by Hull's multi-disciplinary RBI study team. The team includes engineers from plant operations, maintenance and inspection departments, including experts in metallurgy and mechanical integrity from PP SIMTECH and BP. RBI driven integrity assurance is a dynamic process, and as such rbiAsyst also

supports the subsequent updates following inspections or operational changes.

The application process and all team decisions are fully reflected in rbiAsyst, allowing for total transparency and, crucially, auditability. The team study and implementation process built into this methodology has also widened individuals' knowledge, improved a 'working together' culture across various disciplines, and captured valuable plant knowledge.

"We have now established a consistent, structured and fully auditable RBI assurance system which has allowed us to reap many benefits," says Clive Breeden, BP technology manager, materials and corrosion. Aside from the obvious targeted inspection with resultant cost benefits, there have been some real gains in terms of teamwork and re-defining process operations through the formation of multi-discipline teams.

"These teams have increased our understanding of key process variables and the impact on potential damage mechanisms. One of the important challenges for the future will be to ensure we maintain an ongoing commitment to the RBI process."

During the early project phase, the RBI assurance process was reviewed and endorsed by an independent peer group. It was also successful against subsequent audits carried out by the UK Health and Safety Executive (HSE) and meets the essential requirements of the *RBI Best-practice Guide* issued by the HSE.

"We believe that Hull has addressed RBI in a very comprehensive and professional way and we are investing a lot of effort into it and getting a lot out of it," Verdon-Smith adds. "It has had good buy-in and support from the manufacturing teams which has been really encouraging. We have already seen evidence that the new inspection programmes are providing increased integrity assurance."

But the Hull team warns there is no short cut to RBI driven integrity assurance of plant and equipment.

The implementation needs commitment and support from site leadership teams to be successful. The process also needs to be thorough and provide the required self-assurance to inspection and plant operations engineers.

Operational parameters defined by RBI teams must also be monitored to ensure damage mechanism rates do not increase as well as to prevent initiation of new damage mechanisms.

BP Chemicals and PP SIMTECH recently signed an agreement making available the RBI assurance process and rbiAsyst to all BP sites worldwide. This provides an opportunity for any BP site, immaterial of the industry sector, to either implement this RBI assurance process for the first time, or to help enhance their existing RBI practices.