Organizes

RBI 2016
Risk Based Inspection & Maintenance Summit
Date: 26-27 August 2016
Venue: Hotel The Grand, New Delhi

Souvenir

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Mr. S. Ghatak Chaudhuri  
Ex. Deputy General Manager (M&I)  
IOCL

Dear participants, I rejoice to thank you and extremely grateful for your healthy cooperation and support extended to RBI 2016 to make it into a grand success. This is the first such initiative to comprehend the need of industry for faster implementation of asset integrity. Asset integrity attains highest importance in process plants specially refineries, petrochemicals, fertilizers etc. primarily because the consequence are too severe. The reliable operation of the plants gives the best competitive advantage. Although asset integrity deals with all aspects of design, quality control, operation & maintenance but to improve the asset integrity the primary objective is to implement Risk Based Inspection (RBI) and Reliability Centered Maintenance (RCM). RBI is best suited for static equipment/ piping and RCM is best suited for Rotary, Electrical & Instrumentation items.

The technical program was well designed and balanced to cover various important aspects of equipment, piping and pipeline. Very relevant topics like RBI implementation, optimization of inspection plan, corrosion management, advanced NDT, Reliability Centered Maintenance, fitness for service & way forward was nicely covered in various sessions. The participation being from user industries, software providers, technical support, NDT knowledge and key experience of past implementations could provide a common platform for conducive discussion and participation by all the participants.

I am sure that all the discussions created a fruitful platform with better understanding and wisdom for future implementation. As suggested the principles of RBI should be considered during design stage & quality control to improve the reliability of the assets. The Integrity Operating Window (IOW) was also discussed during the seminar to highlight the importance of maintaining the IOW within the desired limits to avoid unwanted failure.

We are happy that people from all aspects of asset integrity specially the users, consultants & specialists had participated in the seminar to make it interactive, fruitful and provide a feast of technical information and wisdom to ensure smooth implementation of RBI and RCM. Exhibitors have also showcased their services and product for the upcoming new technologies for technological support. I am thankful to all the sponsors for their timely support and cooperation not only financially but also technically.

Mr. Chander P. Assi  
RBI Specialist  
Cassi (UK) Ltd.

Greetings and congratulations to the technical and organizing committee for hosting the 1st International Conference and Exhibition on Risk Based Inspection (RBI) 2016 in New Delhi, India. This inaugural conference provided a unique networking platform in terms of interaction amongst professionals from various government and private industries. The two day event helps to understand, how RBI can be integrated with existing inspection plans for developing sustainable asset integrity management strategies.

The technical program has been well planned and is comprehensive, focusing on all important aspects of Risk Based Inspection relevant and applicable to the oil & gas, petrochemical and refinery facilities in India. The participants are benefited by learning and increasing their awareness and knowledge for implementing Risk based inspection and maintenance methodologies to help maintain the integrity of their assets by determining the most economic use of maintenance resources, and optimizing the inspection activities based on risk management.

The conference will consider the state-of-the-art Risk Based Inspection methodologies, RBI analysis & implementation, Integrity Operating Windows (IOW), Leak Detection & Integrity Monitoring, Advanced NDE techniques, Corrosion Management Programs, Engineering Evaluations and Fitness for Service (FFS) Assessments.

The exhibition provides an effective platform for Maintenance, Inspection, Operation & Corrosion professionals across the various industries, research institutions and academia for exchanging ideas, acquiring knowledge / information regarding existing and upcoming products and technologies. For successful implementation of risk based inspection programs total management commitment and support from regulatory bodies is essential and helps to achieve the goal of developing safer and more efficient facilities across the industry.

Again, I liked to thank the organizers and wished that there will be many more such conferences on the subject in the coming years.
Eddyfi Technologies in association with Kronix X Ray & Allied Product is grateful to RBI for holding the International Conference & Exhibition “Risk Based Inspection & Maintenance Program” in Delhi, India for the first time. The theme of this Conference comes at an opportune time as the economy in Oil & Gas Sector is threatened by a major fall in Oil prices which has deepened financial crisis in this sector. During this challenging period, it is important for us to engage our peers in constant dialogue. As such this convention is an invaluable opportunity for an exchange of views and ideas.

In our presentation on “Efficient inspection from measurement collection through to report”, we suggest efficient inspection from measurement, data collection, analysis through to report, utilizing Automated Scanning Technique wherein a major reduction in Human Factors and reporting time can be achieved.

Let me extend my warmest welcome to all of you, and wish you all for the fruitful discussion held and way forward. Hope to have similar types of events in near future future to increase awareness in the industry.

Mr. Anupam Kumar
Sales Manager
Eddyfi Technologies/ Silverwing

Mr. Chaudhuri has superannuated from IOCL Headquarters as DGM(M&I). He has over 38 years of experience in the area of Asset Integrity, Implementation of Risk based Inspection, Materials, Corrosion Control, Maintenance & Inspection Services, Conducted many Training Programs/Workshops in Refineries, Petrochemicals, Power Plants & Oil & Gas Pipelines. He has been providing technical consultancy to various organizations like- OISD, Centre for High Technology (CHT), API Workshops, Workshops Organized by Lovraj Kumar Trust, Fertilizer Association, Petroled and others.

Mr Chaudhuri started his career with Indian Oil in 1978 from Assam Oil Division and Digboi Refinery. He was pioneer in implementing RBI & RCM models for IOCL refineries. He was complimented and congratulated by Director-Refineries of IOCL for spearheading a seminar on RBI in IOCL Panipat.

Mr. Ron Selva
Engineering Director
PP Simtech Solutions- UK.

Mr. Ron Selva is the Engineering Director with PP Simtech Solutions in Bolton-UK. He has more than 40 years of industry recognized experience in design, construction, Damage Mechanisms inspection, Fitness-For-Service assessments and in particular RBI based integrity management of Equipments/ Piping in refining, gas processing, petrochemicals & fertilizer manufacturing plants. He has over 20 years of experience in facilitating RBI team studies & successfully implemented RBI in various industries. He has carried out several high profile FFS and inspection assessments to resolve complex problems.

Mr. Selva is an active member of several British Standards Institute (BSI) Technical Committees responsible for the development of codes and standards. Since 1989 – involved in development of Fitness-For-Service (FFS) and Fracture Mechanics assessment codes PD 6493 and BS 7910, many of these procedures are now included in the FFS guidance API 579.

Mr. Selva is a BSc, CEng and a FELLOW of the Institute of Mechanical Engineers in the UK.
Mr. Chander P. Assi
RBI Specialist
Cassi (UK) Ltd.

Mr. Chander Assi is a Consultant with Cassi (UK) Ltd situated in Nottingham-UK. His experience includes: Asset Integrity, Corrosion, Inspection, RBI, SQM, QMS Auditing. He has worked with world renowned companies like British Petroleum, Lloyds Register, ABS Consulting and CB&I etc.

He is a certified API 510 Pressure Vessel Inspector, accredited in National Board of Boiler and Pressure Vessel and CSWIP Plant Inspector, IRCA registered QMS Lead Auditor (A009834), ASME National Board Authorized Inspector (11755), API 510 (37673) Plant Inspector Level 1 CSWIP, RBI Facilitator, MERIDIUM APM-3.5.1 Inspection Management & RCM short course. He is regularly providing training and lectures for new and experienced Plant Inspectors and integrity engineers.

Mr. Assi holds an MSc in Corrosion Science and Engineering from the University of Manchester Institute of Science and Technology (UMIST) and the Certificate of Membership of Cranfield University in Welding and Joining Technology.

Mr. Ashish Khera
Director
Allied Engineers

Mr. Ashish Khera is Director of Allied Engineers, New Delhi. He has experience related to In Line Inspection (ILI) with Pipetronix (PTX) followed by several years as a Pipeline Integrity Engineer at Marr Associates, Canada. During this time, he was primarily involved in the areas of stress corrosion cracking (SCC) and Direct Assessment (DA) programs on pipeline systems in Canada and the USA.

He has been awarded the NACE Distinction Corrosion & Technology Award at CORCON 2013. He has published over 25 technical papers in Pipeline Integrity Management. Mr. Khera is a Petroleum Engineer from University of Alberta, Canada. He is a Certified Professional Engineer, Certified Instructor for ASME B31.8S – Managing Pipeline Integrity of Gas Systems, Certified Instructor for NACE International “Direct Assessment” and “Internal Corrosion for pipelines”, and Co-Author of the latest NACE Pipeline course on “Direct Assessment”.

Chief Technical

Mr. S. Ghatak Choudhuri, Ex-DGM, IOCL

Steering Committee Members

Dr. Anand Kumar, Director-Petrotech, Ex-Director of IOCL (R&D)

Mr. Narendra Kumar, Executive Director, GAIL

Mr. M. C. Das, Executive Director-HSE, ONGC

Ms. Susmita Sengupta, Director Technical, MGL

Mr. Ron Selva, Director Engg., P P Simtech Solutions Ltd. (UK)

Mr. Anupam Kumar, Sales & Mktg Manager, Silverwing (UAE)

Mr. Chander P. Assi, RBI Specialist, Cassi (UK) Ltd.

Mr. S. K. Bagchi, Addl. Director, OISD

Mr. K. B. Singh, Consultant, Seal for Life

Mr. R. Chaudhury, Consultant; Ex DGM & Head- Corrosion Control, EIL

Mr. J. N. Agrawal, Ex. Chief Manager- O&M, GAIL

Mr. Shivakumar Kulkarni, Technical Manager, Lloyd’s Register

Mr. R. N. Verma, Senior Inspection Manager, IOCL Paradip

Mr. Loganatha Pandian, Mechanical Integrity Consultant, Meridium
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<tr>
<th>Name</th>
<th>Title/Position</th>
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<tr>
<td>Dr. Asutosh Karnatak</td>
<td>Director- Projects GAIL</td>
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<td>Dr. Anand Kumar</td>
<td>Director Petrotech Ex. Director of IOCL</td>
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<td>Mr. M. C. Das</td>
<td>Executive Director &amp; Chief HSE ONGC</td>
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<td>Mr. E. S. Ranganathan</td>
<td>Managing Director IGL</td>
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<td>Dr. Mahendra Pal</td>
<td>G. M., HSE ONGC</td>
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<tr>
<td>Mr. Shivram Jaiswal</td>
<td>Group General Manager Chief Pipelines ONGC</td>
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<td>Mr. Rajesh Ahuja</td>
<td>General Manager IOCL</td>
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<td>Mr. L. C. GOPALANI</td>
<td>General Manager (TS) IOCL PANIPAT</td>
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<td>Mr. S. K. Bagchi</td>
<td>Addl. Director OISD</td>
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<td>Dr. C. Kannan</td>
<td>Deputy General Manager - R&amp;D IOCL</td>
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<tr>
<td>Mr. Rajendra Kumar</td>
<td>Ex General Manager- Pipelines IOCL</td>
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<tr>
<td>Mr. R. N. Verma</td>
<td>Senior Inspection Manager IOCL - Paradip</td>
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<tr>
<td>Mr. Dayaram Gupta</td>
<td>Chairman ISNT Delhi Chapter</td>
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<td>Mr. Dinesh Gupta</td>
<td>Vice Chairman ISNT Delhi Chapter</td>
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<td>Mr. T. kamraj</td>
<td>Hony Gen. Secretary ISNT Delhi Chapter</td>
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<td>Dr. S. Nand</td>
<td>Deputy Director General Fertilizer Association of India (FAI)</td>
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<td>Mr. Anil Kumar</td>
<td>Vice President, Alkali Manufacturers Association of India (AMAI)</td>
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<td>Mr. Mahender Singh</td>
<td>Secretary General, Chemicals &amp; Petrochemicals Manufacturers Association of India (CPMAI)</td>
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<td>Mr. Amarbir Anand</td>
<td>Director, Scottish High Commission</td>
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Two Concurrent Conferences One AIM

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AIM 2017
International Conference & Exhibition on “Asset Integrity Management” (AIM 2017)
18-19 August 2017, Hotel Grand, New Delhi
www.assetintegritymanagement.org

RBI 2017
2nd International Conference & Exhibition on “Risk Based Inspection & Maintenance” (RBI 2017)
18-19 August 2017, Hotel Grand, New Delhi
www.riskbasedinspection.org
International Conference & Exhibition on “Risk Based Inspection & Maintenance - RBI 2016”
26 – 27 August 2016, The Grand Hotel, Vasant Kunj, New Delhi
Conference Program - RBI 2016

Day 1: 26th August 2016

0900 – 0930 hours  Registration

0930 – 1100 hours  Session 1

Importance & Necessity of Risk Based Inspection - key tool for Asset Integrity
Opening of Conference with lamp lighting
• Welcome address by Chief of Organizing Committee, RBI 2016 - Mr. A. Mukherjee, MatCorr
• Theme address by Chief of Technical Committee - Mr. S. Ghatak Choudhuri (Ex. Deputy General Manager (M&I), Indian Oil Corporation) - “Reliability improvement of asset by implementation of RBI & RCM”
• Special address - Mr. Ashish Khera (Director - Allied Engineers) - “Asset Integrity Management for Refineries”
• Special address - Mr. Ron Selva (Engineering Director, PP Simtech Solutions - UK)
• Special address - Mr. Chander Assi (Director- Cassi UK)
Vote of thanks: Chief of Technical Committee – RBI 2016

1100 – 1130 hours  Tea /coffee break

1130 – 1300 hours  Session 2

Risk Management & Analysis techniques: RBI implementation & best practices
Mr. S. Ghatak Choudhuri (Chair), Mr. Chander P. Assi (Co-chair)
• “What you need to know about RBI - from implementation to technology platform” – Mr. Loganatha Pandian (Meridium).
• “Technical Specification for Ensuring Successful Implementation of Risk Based Inspection (RBI) Best Practice” – Mr. Ron Selva (PP Simtech).
• “Ageing and Life Extension (ALE) Studies Using LLOYD’S REGISTER RBI Methodology” – Mr. Dirkjan Schuld & Mr. S. L. Kulkarni (Lloyds Register).

1300 – 1400 hours  Networking Lunch

1400 – 1530 hours  Session 3

Optimization of Inspection Plan Based on RBI to maintain Asset Integrity
Mr. Ron Selva (Chair) / Mr. S. L. Kulkarni (Co-chair)
• “Integrating Risk Based Inspection (RBI) methodology into project Lifecycle” – Mr. Chander P. Assi (Cassi UK).
• “Optimization of Inspection recommendations” – Mr. S. Ghatak Choudhuri: DGM (M&I, IOCL).
• “Structural integrity management of fixed offshore structures in western coast of India” – Mr. Dinesh Kumar (ONGC).

1530 – 1600 hours  Tea / Coffee Break

1600 – 1730 hours  Session 4

Development of Integrity & Corrosion Management Plan- for assuring Reliability/ Integrity of Assets
Mr. S. Ghatak Choudhuri (Chair) / Mr. Anupam Kumar (Co-chair)
• “Corrosion Management Plan for Enhanced Reliability” – Mr. Digvijay Charan (Fluor).
• “Asset Integrity Management System for static equipment in Bharat Petroleum Corporation Limited, Mumbai refinery” – Mr. P. J. M. Rao/ Mr. Bibhudatta Paricha (BPCL).
• “Asset Integrity Management- A Risk Based Approach” in MGL – Mr. Ajoy Kr. Paul (MGL).

PANEL DISCUSSION:
Risk Based Inspection & Maintenance plan vis-a-vis conventional inspection and maintenance ideologes & techniques
Panelists: Mr. S. Ghatak Choudhuri (Chief Technical), Mr. Ron Selva (PP Simtech), Mr. Dirk Schuld (Lloyds Register), Mr. Digvijay Charan (Fluor), Mr. Anupam Kumar (Silverwing)

Summary of the day - Chief of Technical Committee – RBI 2016

Day 2: 27th August 2016

0900 – 0930 hours  Morning Tea

0930 – 1100 hours  Session 5

Implementation of Advanced NDT & Inspection Techniques
Mr. L. C. Gopalani (IOC, Chair) / Dr. Shova Bhattacharjee (R&D IOCL, Co-chair)
• “Enhancing Inspection Through Large Scale Data Collection and Analysis” – Mr. Anupam Kumar (Silverwing).
• “Advanced Inspection for 100% inspection of in-service boiler tube – Power” – Mr. S. Gnanesakaran (GE Oil & Gas).
• “NDT techniques using high sensitivity INFRARED Imagers” – Mr. T. P. Singh (Flir Systems India).
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<th>Time</th>
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<tr>
<td>1100 – 1130 hours</td>
<td>Tea/coffee break</td>
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<td>1130 – 1300 hours</td>
<td>Session 6</td>
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<td>Importance of Reliability Centered Maintenance (RCM) in process plants</td>
<td>Mr. S. Ghatak Choudhuri (Chair) / Mr. Chander Assi (Co-chair)</td>
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<td>• “Integrity Management – RCM of Process Plant”</td>
<td>Mr. John Eapen (DNV-GL)</td>
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<td>• “RCM &amp; RBI Consulting- How enabled through technology”</td>
<td>Mr. Sheelesh Mehta (Wipro)</td>
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<td>• “Asset Efficiency Optimization and Client Need Analysis process”</td>
<td>Mr. Rahul E. Deshpande (SKF)</td>
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<td>1300 – 1400 hours</td>
<td>Networking Lunch</td>
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<td>1400 – 1530 hours</td>
<td>Session 7</td>
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<td>Fitness for Service evaluation for Asset Integrity</td>
<td>Ms. Susmita Sengupta (Chair) / Mr. K. R. Ramesh- ONGC (Co-chair)</td>
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<td>• “Living with Defects: Replace/Repair or prove Fitness-For-Service?”</td>
<td>Mr. Ron Selva (PP Simtech)</td>
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<td>• “Fitness for service assessment of Above Ground Storage Tank – Application of Risk Based Inspection”</td>
<td>Mr. Santanu Saha (Intertek)</td>
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<td>• “IOCL’s experiences with Fracture mechanics based Fitness For Purpose assessment of static equipment through a few case studies”</td>
<td>Dr. Shova Bhattacharjee (R&amp;D, IOCL)</td>
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<tr>
<td>1530 – 1600 hours</td>
<td>Tea / Coffee Break</td>
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<td>1600 – 1730 hours</td>
<td>PANEL Discussion</td>
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<td>Barriers to RBI Implementation and suggestions for improvement</td>
<td>Mr. Ron Selva (PP Simtech), Mr. Loganatha Pandian (Meridium), Mr. Dirk Schild (Lloyds Register), Dr. Kannan (R&amp;D, IOCL), Mr. Chander Assi (Cassi UK)</td>
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<td>1600 – 1730 hours</td>
<td>Session 8</td>
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<td>Way forward- opportunities &amp; challenges for implementation of RBI</td>
<td>Mr. Ron Selva (Chair) / Mr. Dirk Schuld (Co-chair)</td>
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<td>• “Integrity Management of Pipeline Networks”</td>
<td>Mr. John Eapen</td>
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<td>• “Way forward for implementation of RBI &amp; IOW”</td>
<td>Mr. S. Ghatak Choudhuri (Chief Technical)</td>
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Closing Remarks and Observations
Chief of Technical Committee – RBI 2016
Vote of Thanks- Chief of Organizing Committee, RBI 2016

Invited Guests/Speakers

Mr. Ajoy Kumar Paul
Head Asset Integrity
Mahanagar Gas Ltd. (MGL), Mumbai (India).

Mr. Ajoy K. Paul is currently working as Head Asset Integrity with Mahanagar Gas Ltd (MGL) located in Mumbai-India. He has core expertise in Risk Management, HSE capacity building, Environment Protection & Sustainability, Occupational health, Safety & Industrial hygiene, Process Safety & Asset Integrity. He has 20 years experience in various HSE & Asset Integrity domains in Engineering & manufacturing industries, Construction projects & Process Plants. Mr. Paul has Bachelor of Engineering (Mechanical) with Post graduation in Industrial Safety & Environment Management.

Mr. Anupam Kumar
Sales Manager
Silverwing, Dubai (UAE).

Mr. Anupam Kumar is currently working as Sales Manager with Silverwing located in Dubai- UAE. He has over 15 years of experience in sales and marketing and business development activities of NDT Equipment /NDT Systems/Industrial products/MRO products/Capital Equipments/Heavy Machineries/Industrial Lubricant/Industrial Speciality Chemicals Sales and others.

He has certification in NDT Level II (Penetrant Testing-PT), NDT level II (Magnetic Testing-MT), NDT Level II (Ultrasonic Testing-UT), NDT Level II (Eddy Current-EC), NDT Level II (Radiography Testing-RT) and NDT Level II in (Visual Testing-VT) as per American Society of Non Destructive testing (ASNT). He also has obtained training in Eddy Current method in Germany & in Italy. Mr. Kumar has Diploma in Aircraft Maintenance Engineering and MBA in marketing.
Mr. Bibhudatta Paricha
Dy. Manager (Inspection)
Bharat Petroleum Corporation Ltd., Mumbai Refinery.

He is currently working as an inspection engineer in Bharat Petroleum Corporation Ltd., Mumbai refinery since 2009 and responsible for asset integrity of static equipments of primary processing units. He is Bachelor of Technology in Mechanical from Indian Institute of Technology, Banaras Hindu University, Varanasi.

Mr. Digvijay Kumar Charan
Metallurgy & Corrosion Specialist
Fluor Daniel India, Gurgaon (India).

Mr. Digvijay Charan is currently working as Metallurgy & Corrosion Specialist, Fluor Daniel India located in Gurgaon- India. He has around 36 Years in plant inspection, material selection, development of material selection diagram (MSD) based on process flow diagram (PFD), failure investigation, corrosion prevention, corrosion monitoring, risk based inspection, remaining life assessment.

He has worked in various organizations such as Indian Oil Corporation Ltd., Reliance Industries Ltd., Abu Dhabi National Oil company (ADNOC), Kuwait National Petroleum Company (KNPC), Saudi Arabia Basic Industries Corporation (SABIC), Essar Engineering Services Limited, Mumbai, Foster Wheeler India Private Ltd., Chennai, India, Fluor Daniel India Private Ltd., Gurgaon, India. Mr. Charan has Bachelor of Engineering (Metallurgy) from Ranchi University.

Mr. Dinesh Kumar
GGM-Head Structures
Institute of Engineering and Ocean Technology, ONGC.

Mr. Dinesh Kumar is working as Group General Manager in ONGC based in Mumbai, India. He is presently heading the Structure section of Institute of Engineering and Ocean Technology (IEOT), a premier R&D Institute of ONGC. He has more than 20 years of experience in analysis and design of offshore structures. During his tenure at IEOT, he carried out studies on Requalification of platforms in western offshore; Damage analysis of offshore structures, Special studies like effect of marine growth on structures, Design of innovative structural concepts for minimal facility platforms for marginal fields etc. Presently, he is working on Life extension studies of existing fixed offshore structures, which have outlived their design lives.

He also developed expertise in the area of deep water structures particularly in marine risers and mooring systems in deeper water in collaboration with MARINTEK, Norway.

Mr. Dirkjan Schuld
Area Operations Manager, Asset Integrity Services
Continental Europe, Middle-East, India & Asia (Lloyd’s Register).

Mr. Dirkjan Schuld is Area Operations Manager, Asset Integrity Services for Lloyd’s Register- Continental Europe, Middle-East, India & Asia located in Rotterdam- Netherlands.

Mr. Schuld has 20 years of working experience for the energy market including upstream, midstream, downstream, chemicals and power. His expertise include safety, quality and P&L, enable tools, processes and resources to ensure successful delivery of projects and operations, serve as a project director on 5 large and complex projects, project board member for several international complex projects. Mr. Schuld has BSc. in Mechanical Engineering (ing, BSc.) with specialization in- Quality Assurance, Business Management; MSc. in Business Administration (doctoral / drs., MSc.BA.) with specialization in Advanced Strategy Management.

Mr. Gnanasekaran Selvanandam
Technical Manager- South Asia
Ultrasonic & Eddy Current Testing, GE Digital Solution, Chennai (India).

Mr. Gnanasekaran Selvanandam is currently working as Technical Manager- South Asia- Advanced Ultrasonic & Eddy Current Testing Solutions with GE Digital Solution – Inspection Technologies located in Chennai- India. He has 15 years of field experience in various verticals like O&G, Power, Aviation and others. His core expertise include application support for Ultrasonic and Eddy current solution to customer to address their inspection need or NDT challenges.

He has worked as Technical Manager (NDT & Welding) in L&T, Chennai and prior to that in J Ray McDermott, Dubai as NDT and Welding specialist. Mr. Gnanasekaran has Bachelor of Engineering (Mechanical) and ASNT level 3.
Mr. John Eapen  
Head of Asset Integrity  
DNV-GL India.

Mr. John Eapen is currently heading Asset Integrity & ISRS with DNV-GL India located in Mumbai-India. He has more than 20 years of multi-functional work experience in Asset integrity of process plants and pipelines, project management, design of static equipment and HSEQ Management system audits of plants. He has been involved in integrity assessments of various onshore and offshore pipelines which included Risk Based Inspection of Pipelines. John has performed Risk Based Inspection studies for over 100 offshore platforms and various onshore installations of Oil & Gas clients in India.

He has delivered ISRS assessments (HSEQ Management system Audits) of various oil & gas installations including cross country pipelines. He has helped develop the Reliability centred maintenance (RCM) programme of various refineries in India. Mr. Eapen has Bachelor of Engineering (Mechanical).

Dr. Kannan Chandrasekaran  
head of Applied Metallurgy & Pipeline Research laboratories  
Indian Oil R&D Center, Faridabad (India).

Dr. Kannan Chandrasekaran is currently heading the Applied Metallurgy & Pipeline Research laboratories at Indian Oil R&D Center, Faridabad, India as Deputy General Manager. He specializes in Material selection for Corrosion prevention, Failure analysis, Condition monitoring & Advanced NDT, Fitness for purpose evaluation and Life extension of refinery components.

He has over 26 years of experience in working with the materials related issues of refining industry. He is a member of the NACE-USA and also the executive committee member of NACE Gateway India section. Dr. Kannan has More than 35 technical publications in Journals & conferences of repute. He has authored more than hundred technical / project reports. He has been conferred with the Petrociel Innovator of the year – Team Award for 2015. He has a B.E. (Metallurgy) from IITC, Bangalore and a M.Tech. in Industrial Metallurgy from IIT Madras. He obtained his Doctorate from the IIT, Delhi.

Mr. Loganatha Pandian  
Mechanical Integrity Consultant  
Meridium - Bangalore (India).

Mr. Loganatha Pandian is a Mechanical Integrity Consultant with Meridium, Bangalore - India. Loganatha Pandian’s 12 year career in the Oil and Gas industry includes various positions starting from Projects, Corrosion and Inspection. His current job responsibilities includes- advocating clients on APM and RBI work processes, conducting mechanical integrity blue-printing workshops, risk based inspection facilitation, training, corrosion studies and implementing Meridium software solution.

He has experience working with major industry players such as, ExxonMobil, British Petroleum, Tonen General, Star Petroleum, INPEX, BPCL, Essar, Reliance, etc. He is a certified practitioner in various API standards such as API 571, API 580, API 570 and API 510. He is an active member of the Society of Maintenance and Reliability Professionals (SMRP). Mr. Pandian has Bachelor in Engineering(Mechanical) and Masters in Business Administration (Finance).

Mr. Rahul Eknath Deshpande  
Sales & Marketing for Industrial Markets  
SKF Reliability Services, Pune (India).

Mr. Rahul Deshpande is currently working in Sales & Marketing for Industrial Markets- Reliability Services with SKF India located in Pune-India. He has over 14 years of experience in Mechanical maintenance management of rotatory asset, ISO certified cat2 vibration analyst and a trainer on ‘Predictive and Preventive maintenance, RCM, RCA, Vibration analysis, Have hands on experience on projects related to Asset Efficiency Optimization, Implementation of ‘Asset Management services’ for SKF with expertise in Rotary Asset, Have developed and delivered training curricula across hierarchy for maintenance and Reliability professionals, Centrally responsible for designing, developing and delivering Training curricula for various industries including HPI, Chemical and Process, Power, Automotive, F&B, Cement. Mr. Deshpande has Bachelor of Engineering (Mechanical) and Six Sigma, ISO Certified Analyst.
Mr. Santanu Saha
Technical Manager
Intertek-Inspec, Sharjah (UAE).

Mr. Santanu Saha is currently working as Technical Manager for Intertek-Inspec located in Sharjah-UAE. His responsibilities include training and certification of INSPEC NDT personnel, Preparation of procedures for various Gas and Petroleum projects. He has experience in Pressure vessel inspection & Storage Tank Inspection on various projects in accordance with API 510 & API 653 Inspection Code.

He is NDT Level III service for ASME Division 1 & 2 pressure vessels in at least 130 ASME BPV & B31.1 pressure piping coded fabrication shops for Pressure Vessels, piping etc. Appointed NDE Level III for at least 100 ASME approved manufacturers all over UAE. He has Bachelors in Maths (Hons.) from Calcutta University; ASNT NDT Level III in 9 NDT Methods e.g. AE, ET, JR, LT, MT, PT, RT, UT, & VT; ISO 9712/PCN NDT Level 3 in UT, RT, MT, PT, UT-PHASED ARRAY & TOFD; CSWIP Level 2 in LRUT; API 653; 570, 510 & 580 certified Inspector; CSWIP & BGAS Welding & Coating Inspector.

Mr. Shelesh Mehta
Sr. Domain/ Functional Consultant – Asset Performance Management
Wipro Technologies, Bangalore (India).

Mr. Shelesh Mehta is currently working as Sr. Domain/ Functional Consultant – Asset Performance Management with Wipro Technologies located in Bangalore-India. He has 10 years of experience in API 580 - RBI (Risk Based Inspection), RCM (Reliability Centered Maintenance), FMEA (Failure Mode & Effect Analysis), PSM (Process Safety Management), PIAM (Plant Integrity Assurance & Manual). He was the offshore lead of Meridium & Asset Management Application for Refinery & Petrochemical sites with British Petroleum project. He has worked with major companies like Reliance Industries & Aditya Birla Group. Mr. Mehta has Bachelor of Engineering (Mechanical).

Mr. S. L. Kulkarni
Operation Manager
Lloyd's Register - Mumbai.

Mr. Shivakumar Kulkarni is the Operations Manager for Lloyd's Register Asia situated in Mumbai-India. His core expertise includes business development and operations of asset integrity services in India. He is responsible for business development activities, looks after operations and project executions, responsible for profit and loss. Mr. Kulkarni has Masters in Technology in Maintenance Engineering.

Dr. (Mrs.) Sova Bhattacharya
Chief Research Manager (Metallurgy Department)
IOCL R&D, Faridabad (India).

Dr. Shova Bhattacharya is currently engaged as Chief Research Manager in Applied Metallurgy Department with IOCL R&D located in Faridabad-India. She has working experience with Material failure analysis, Remaining life assessment and Fitness for service assessment of refining industry static infrastructure. Published 50 technical paper on innovative research & fundamental research activities. Responsible for successful conduct of R&D projects to improve RLA capability. Presently undergoing projects include- Miniature sample testing technology, Creep model development of refinery materials, Advanced NDT tool developmental programme.

She presented various technical papers in international / national conferences in India and abroad such as WCNDT, NACE, Petrotech, NCCI, IIM, NCFA. She is Doctorate(Ph.D) in engineering(Applied Mechanics) from IIT Delhi & M.E. & B.E. in metallurgical engineering.
Ms. Susmita Sengupta
Technical Director
Mahanagar Gas Ltd. (MGL), Mumbai (India).

Ms. Susmita Sengupta is currently working as Technical Director of Mahanagar Gas Ltd. (MGL) located in Mumbai-India. She has held the position of Director - Engineering, Project Management at DCP Midstream, USA. She has led internal and EPCM engineering / construction project activities for pipeline, compressor stations, processing plants. She worked as Director for ENOGEX/OGE, Midstream Company in USA, as Engineering Manager, Operations Engineering & Corrosion department for Vermont Gas Systems, USA, as Formal Leader, South East Region, Construction & Maintenance for MICHCON Gas CGD Company, USA, as a Program Manager for British Gas Plc., London/Loughborough, UK among others.

She is affiliated to GRI/PRCI NDT Committee, North East Gas Association, AGA, ASME, ACHE Brief. Ms. Sengupta has M.Sc in Chemical and Petroleum Engineering from the University of Calgary, Alberta, Canada and B.A.Sc (Hons.) in Chemical Engineering from the University of Waterloo, Ontario, Canada. She is an AOSTRA Scholar from Alberta Oil Sands Technology and Research Authority Scholarship. She holds an International Pipeline Inspector’s certificateOperator Qualification (OQ) holder in both gas distribution and transmission operations.

Mr. T. P. Singh
Director and Country Manager
FLIR-Systems India.

Mr. T. P. Singh is currently taking care of India operations for FLIR-Instruments. He has more than 21 years of work experience in the field of Power, Automation, R&D and Security / Surveillance. Mr. Singh is a graduate Engineer with degree of Bachelor of Engineering in Electronics and Communication. He did management course from IIM, Calcutta.

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“What You Need to Know about RBI – from Implementation to Technology Platform”

Author: - Mr. Loganatha Pandian
Mechanical Integrity Consultant,
Meridium - Bangalore (India).

Abstract:
Since the inception of OSHA’s PSM 1910.119, companies are slowly moving from time-based inspection to risk-based approach. Risk based inspection is a widely accepted method currently practiced across the refining and petrochemical industry. While it is typically thought that the Mechanical Integrity domain of PSM includes only static equipment’s it indeed covers all types of equipment’s that contribute to prevention of a process safety incident including safety instrumented systems and rotating machinery.

RBI is a risk assessment and management process that is focused on loss of containment of pressurized equipment in processing facilities due to material deterioration. These risks are managed primarily through equipment inspection. API 580 gives guidelines for implementing a risk based inspection program based on qualitative, semi-quantitative or quantitative methodologies. Preliminary screening and criticality assessment may give insight on the methodology to be applied in the qualitative to quantitative RBI continuum.

In most processing plants, a large percent of the total unit risk will be concentrated in a relatively small percent of the equipment items. These potential high-risk components may require greater attention, perhaps through a revised inspection plan.

The API RBI methodology may be used to manage the overall risk of a plant by focusing inspection efforts on the equipment with the highest risk. It provides the basis for making informed decisions on inspection frequency, the extent of inspection, and the most suitable type of NDE.

When selecting an appropriate technology platform for managing RBI studies, various options are available in the market starting from single-point solutions to enterprise wide solutions. Various factors like, standardization of risk management philosophy (like, type of RBI calculator, risk matrix, criticality screening approaches), CMMS integration capabilities for work management, integration with process historians for IOW management, integration with various third-party systems like, MoC systems, RCA systems, LIMS systems, and capability for centralized recommendation management in pursuit of an overall MI management may need to be considered.
“Technical Specification for Ensuring Successful Implementation of Risk Based Inspection (RBI) Best Practice”

Author: - Mr. Ron Selva
B.Sc, C.Eng, F.I.Mech.E
PP SIMTECH Solutions Ltd.

Abstract:
This paper is written to help plant sites wishing to implement Risk Based Inspection (RBI) for the first time as well as for those plant sites not satisfied with their existing RBI process at site and considering a change. It is also considered of immense value for plant sites wishing to set up an RBI audit programme to review their existing RBI technology process and site practices and make the necessary improvements. The technical specification provided in this paper for ensuring successful implementation of RBI is based on current knowledge of RBI technology, best practices, industry experience and feedback particularly from inspection engineers at a variety of plant sites.

Guidance is also provided to plant sites on key technical aspects which they must include when writing their Technical Specification for RBI Project Tender enquiry, together with various criteria which must be satisfied when they finally evaluate and select the RBI Service Provider.

Any plant site following these guidelines will ensure achievement of its site strategic goals, whilst help minimise the serious inconsistencies exist between RBI service providers with respect to the 5 critical aspects mentioned below.

As a background, RBI is a technology process which, when correctly implemented, is used to formally optimise the inspection efforts for each equipment item of plant within the boundaries of appropriately defined integrity operating limits, whilst minimising equipment failure risks caused by the relevant Damage Mechanisms (DMs). RBI driven integrity management is relevant to all static equipment, interconnected piping, storage tanks, pipelines and pressure relief valves operating in the oil, gas, petrochemical, fertilizer manufacturing and power generating plants.

The management process is also evergreen as the initial RBI study of each of these items requires reviews and updates after inspection or when operational changes are made. As such the integrity management responsibilities through the RBI process involve not just the Inspection Engineers but also the Operations and Process Engineers at a plant site.

As RBI is still a developing technology, there are various RBI methodologies are available in the marketplace, including API 581. Each has its own merits and weaknesses. As such, those companies who have already implemented RBI at plant sites have reported varying outcomes from implementation. It is emphasized therefore, only through proper implementation of a robust and user-friendly RBI technology process, the perceived substantial safety & financial benefits can be achieved by plant sites.
"Integrating Risk Based Inspection (RBI) methodology into project lifecycle"

**Author:** - Mr. Chander P Assi  
**RBI Specialist**  
**Cassi (UK) Ltd.**

**Abstract:**
Risk Based Inspection (RBI) is now commonly used during the In-Service “Operations” phase for optimizing inspection strategies for the Oil and Gas, Petrochemical, Refinery and Power Facilities. RBI methodologies have now replaced the prescriptive manner in which inspection intervals for Pressure Equipment were determined in the past. The approach now is to prioritize inspections based on risk, ensuring and focusing on high risk items to achieve a safety-focused and effective inspection plan. Typical items covered during RBI study are pressure vessels, heat exchangers, heaters, Safety and relief valves / devices, storage tanks and pipework.

This presentation will briefly identify the benefits of “Operations RBI” and introduce Risk Based inspection principles that can also be used during all the Project Lifecycle Phases-Front End Engineering Design (FEED), Engineering Procurement Construction (EPC) and Commissioning. The benefit of carrying out RBI during EPC gives experienced and competent engineers opportunity to check, confirm and if necessary upgrade material selection, fabrication methods, accessibility for Non-Intrusive inspection techniques that may have been omitted during FEED that was based on the Assumptions made due to incomplete or unapproved Data, PFDs, P&IDs.

Baseline Data required to complete the operation inspection plan can also be gathered during EPC phase so that it can be downloaded into the Corrosion Risk Assessment, Asset Performance Integrity Management System and Maintenance Management System. RBI is now recognized by many API codes as a key tool in meeting the requirements for inspection e.g. API 510 Tenth Edition May 2014 allows the use of RBI assessments that comply with the API Recommended Practice 580 Risk based Inspection Third Edition February 2016. In many countries RBI is now recognized as a key tool in meeting Legislative requirements.

"Risk Based Inspection- Optimization of Inspection Recommendations"

**Author:** - Mr. S. Ghatak Chaudhuri  
**Ex. Deputy General Manager(M&I), IOCL**  
**Key person for implementation of RBI/RCM in IOCL**

**Abstract:**
International Studies indicate that maintenance cost is the 2nd largest cost in the operating expenses in Petroleum Refineries & Petrochemicals. If the lost profit opportunities are added this becomes number one expense and the approach to address such critical decisions are diverse in nature. That is why the methodology of maintenance task selection in a systematic manner to improve reliability of equipment and asset management keeping the safety of the plant at highest priority is a challenging task. In addition understanding the inherent risk of each equipment & piping is also very important for prioritization of the task.

Risk Based Inspection (RBI) is one of the methodology which provides a comprehensive approach with criticality ranking and identifying optimum inspection plan for carrying out maintenance task. This is best suited for static equipment and piping with elaborate methodology for consequence analysis.

Similarly Reliability Centered Maintenance (RCM) is another methodology which can handle efficiently the random failure modes and best suited for rotary, electrical & instrumentation areas. Each failure modes are analyzed through Failure Mode Effect Analysis (FEMA) to identify proper corrective task. A decision logic diagram is also utilized to identify best suited maintenance methods applicable for the equipment like PM, PdM, detective maintenance, run to failure etc.

IOCL has taken up major challenging task to implement RBI & RCM for all the 8 refineries in phased manner. Both RBI & RCM are being implemented simultaneously in the identified units to cover all piping & equipment including small bore piping. Close monitoring of critical parameters which are the cause of failure or signals before any major failure are also covered as per the Integrity Operating Window (IOW) norms. The major shift of the Inspection & Maintenance approach and resource reallocation will result in significant improvement in safety & reliability and will improve the bottom line of the company.
"Structural integrity management of fixed offshore structures in western coast of India"

Author: - Mr. Dinesh Kumar  
GGM-Head Structures  
Institute of Engineering and Ocean Technology, ONGC

Abstract:  
ONGC presently operates more than 265 pile founded jacket platforms installed in average water depths ranging from 25 - 90 meters. These steel tubular structures are required to have adequate strength for withstanding extreme environmental events as well as their vulnerability to fatigue damage due to prevalent sea states needs to be adequately considered. The vitality of the overall integrity management of offshore jacket platforms is predominant and has evolved over a period of time, primarily following the catastrophic damages witnessed due to Hurricanes Juan and Andrew in Gulf of Mexico region in 1985 and 1992 respectively. The findings from the investigation studies caused major changes in the design parameters leading to genesis of the different editions of design code API RP 2A which has recently culminated into introduction of API RP 2SIM meant categorically to address the issues related to structural integrity management (SIM) of fixed offshore structures. It is of paramount importance to have an efficient Structural Integrity Management system (SIMS) in place to ensure the overall health of an offshore platform throughout its life from installation to decommissioning.

A continuous process has to be evolved and executed considering all the operational, structural and functional requirements of the platform. It becomes more important for the old platforms which were designed under a lower hydrodynamic loading regime. These old platforms might require reduced assessment criteria including ultimate strength analysis considering that there is no increase in fatality and environment risk however, the economic risk can be taken at the discretion of the operator. If required, load reduction/strengthening measures may be adopted in view of it under the present loading conditions. In addition to the strength point of view, the accumulated joint fatigue damage due to incident waves needs to be aptly captured. The same will control the design of the inspection campaign. Over a period of time, the inspection strategy has developed into risk based assessments instead of fixed interval inspections. The risk based inspection (RBI) duly considers the criticality of joints and the effect of its failure on the overall integrity of the structure. The risk evaluated is a function of probability of failure and its conditional consequence. The inspection campaign is developed based on the risk evaluated and comparing it to the acceptable target risk. Such a process also considers the different inspection methods to be used and their relative efficiency in detecting cracks/damages, etc. Considering all these issues, the overall SIMS process for managing offshore platforms in western offshore of India has been discussed.

"Corrosion Management Plan For Enhanced Reliability"

Author: - Mr. Digvijay Charan  
Metallurgy & Corrosion Specialist  
Fluor Daniel India Private Ltd., Gurgaon (India)

Abstract:  
For risk assessment, damage mechanism of a mechanical static equipment and piping in a corrosion loop for particular process conditions need to be identified. The damage mechanisms are but not limited to the following types like Thickness Loss, Stress corrosion Cracking, Pitting, Intergranular Corrosion, Hydrogen embrittlement, Thermal fatigue, Overheating, Spheroidization, Sensitization etc. Corrosion management is basically metallurgy and process dependent. This technical paper will highlight the corrosion mitigation methods to minimize the risk involved for specific cases usually encountered in refinery and petrochemicals.
“Asset Integrity Management System for static equipment in Bharat Petroleum Corporation Limited, Mumbai refinery”

Author: 1) Mr. P. J. M. Rao
DGM (Inspection and reliability)
Bharat Petroleum Corporation Ltd., Mumbai Refinery
2) Mr. Bibhudatta Paricha
Dy. Manager (Inspection)
Bharat Petroleum Corporation Ltd., Mumbai Refinery

Abstract:
Inspection Management system (IMS) is base platform for building any Asset Integrity Management System (AIMS). AIMS gets built on 3 major components i.e. strategy development, strategy management and strategy execution. Lot of information gets generated during equipment life cycle. In IMS module, all technical and operating information of equipment’s can be stored. Post equipment inspection, inspection document, inspection notification and inspection task can be created. IMS module can also interact with other Enterprise Resource Planning (ERP) software i.e. sending notification through SAP for executing agency.

After work execution, actual work history can be captured in IMS. Thickness Monitoring (TM) module can be used for storing thickness monitoring location readings of equipment. This module also gives governing corrosion rate and estimated remaining life of equipment. Risk based inspection (RBI) module can be used in developing asset strategies. This gives inspection recommendations for each equipment with extent and frequency of required NDTs to be performed based on Risk ranking. All these modules i.e. IMS, TM and RBI interact and complement each other. Finally this is a continual improvement process. New asset strategies are developed in RBI module based on extent of actual inspection done, confidence for inspection done and new corrosion rate.

Hence, AIMS is a very effective and essential tool for managing performance health of technical assets and RBI will work well in tandem with AIMS.

“Asset Integrity Management- A Risk Based Approach in MGL”

Author: - Mr. Ajoy Kr. Paul
Head Asset Integrity
Mahanagar Gas Ltd. (MGL), Mumbai (India).

Abstract:
In the oil and gas industry, management of the integrity of pipeline has grown to become a serious business because of the overall consequence of pipeline failure: economic, social, environmental, and possibly legal. The Integrity Management System (IMS) forms an integral part of the management and operation of the gas supply system of MGL with safety and integrity. IMS also establishes the ways & means to make strategies, objectives, goals and their realization towards achieving adequate integrity of assets.

It relates to ensure that Gas Supply Assets are designed, constructed, operated & maintained to deliver optimum performance, reliability and safety throughout their working life. MGL has a comprehensive set of risk based techniques as explained below which links to MGL’s ultimate strategic goal for ensuring asset integrity. The main objective is to identify, assess & manage the hazards with a view to bring them down to within ALARP region by means of adequate control measures.

Few risk based approach tools in MGL:
- Pipeline Integrity Management System: The system is in line with ASME B 31.8S which provides cost effective means of identifying what pipeline condition should be, what it actually is and what needs to be done to maintain the pipeline to the desired standards. The objective is to understand and implement various systems, processes & techniques to be followed to carry out integrity management on carbon steel pipeline network, operating at 19 bar (& above) pressure regime and to upkeep its safe operation.
- Risk audit of Assets: The objectives of the risk audit framework are to carry out formal review of major installation namely CNG outlets, DRS, MRS & Service Regulator to identify and address poorly controlled risks.
- Safety Critical Elements SCEs: Identified through bowtie analysis; their performance standards are defined & monitored regularly.
- Change Management: It provides system for the efficient management of technical and organizational changes which may impact upon the safety, health and environmental requirements.
- Non Routine Operations: These are operations which are not undertaken on regular basis and covers sequence of activities with assigned responsibilities. It also covers risk assessment to identify operational hazards and required mitigation measures.
**Enhancing Inspection Through Large Scale Data Collection and Analysis**

**Author:** Mr. Anupam Kumar  
Sales Manager  
Eddyfi Technologies (Silverwing)

**Abstract:**  
Risk Based Inspection (RBI) driven integrity management is relevant to static equipment, piping, storage tanks, pipelines and pressure relief valves operating in the oil, gas, petrochemical, fertilizer manufacturing & power generating plants.

In-service inspection is most valuable where there is uncertainty about the operating conditions, or their effect on the materials, particularly where the conditions are such as to suggest that deterioration is taking place.

NDT performed from the outside of the vessel, i.e. non-invasively, without breaking the containment have the potential to reduce operating costs significantly.

REMOTE SCREENING TECHNIQUES: Remote screening techniques can be defined as those NDT techniques that are applied remotely from areas to be inspected.

In this paper we suggest efficient inspection from measurement, data collection, analysis through to report, utilizing Automated Scanning Technique wherein a major reduction in Human Factors and reporting time can be achieved.

An example for Slug Catcher Inspection by automated UT system of a Qatari gas company is presented to illustrate and discuss the suggested approach.

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**Advanced Phased Array C-Scan Ultrasonic Corrosion Mapping for Tank Bottom Plates – Oil & Gas**

**Author:** Mr. Gnana Sekaran Selvanandam  
Technical Manager - South Asia  
Ultrasonic & Eddy Current Testing, GE Digital Solution, Chennai (India).

**Abstract:**  
In risk based inspection, it is important to use the right techniques to detect flaws, corrosion defects in various equipment. Different types of corrosion mechanisms are prevalent in oil & gas industry like sour corrosion, galvanic corrosion, crevice corrosion, microbiologically induced corrosion, pitting corrosion, flow impingement erosion. Corrosion mapping is required for assuring the asset integrity through asset protection, predictive maintenance, assess remaining component life etc. Understanding of the corrosion morphology is must for optimizing UT setup in order to achieve the highest POD. Different NDT methods are available for corrosion mapping, however every techniques have its own limitations. Guided wave UT, Real time radiography, low frequency eddy current have few limitations and also can provide qualitative inspection, whereas UT can provide quantitative values. Among the various NDT techniques, advanced Phased Array(PA) UT is capable to detect, analyze flaws more accurately. Common applications for PA corrosion mapping are tanks, piping system, flanges, Knock out drums, columns, vessels, pipeline, offshore structures and marine vessels etc. PA has many advantages over other conventional NDT techniques like more accurate, faster inspection times, less expensive, can inspect heavy wall components, repeatable coverage of PA scans, and little risk of missing areas with isolated corrosion.
“NDT techniques using high sensitivity INFRARED Imagers”

Author: - Mr. T. P. Singh  
Director and Country Manager  
FLIR-Systems India.

Abstract:  
Infrared Thermography is the measurement technique which uses infrared cameras to measure radiance, temperature and all quantities linked to heat exchange (heat rate, energy, stress, absorption, diffusivity). IR cameras use the infrared radiation which is emitted by objects (or gases) due to their own temperature in order to provide a remote dynamic thermal image. So this is a non-contact full field tool for measurement and testing.

FLIR cameras with Lock-In, Transient, and Pulse capability possess the ability to perform advanced inspections such as Non-Destructive Testing (NDT) or stress mapping that resolves temperature differences as low as 1 mK.

NDT is a widely used method to evaluate the properties of a material, component or, system without causing damage. Thermal imaging cameras can detect internal defects through target excitation and the observation of thermal differences on a target’s surface. It is a valuable tool for detecting defects and points of failure in composites, solar cells, bridges, and electronics. It is also a great tool for thermal mapping of stress when performing materials testing in various applications like Lock-In Thermography Applications, Transient Thermography Applications, Vibro Thermography Applications, Pulse Thermography Applications, Eddy Current Excitation and Other applications etc.

“Integrity Management – RCM of Process Plant”

Author: - Mr. John Eapen  
Head of Asset Integrity  
DNV-GL India.

Abstract:  
Reliability improvement of assets can be achieved by implementation of Asset Integrity Management System (AIMS). Internationally, the first consolidated approach came up in PAS-55. The approach covers all aspects of industry norms from design, procurement, operation & maintenance including human resource.

The main approach proposed by PAS-55 is Risk Based Inspection (RBI) for static equipment and Reliability Centered Maintenance (RCM) for Rotary, Electrical & Instrumentation items. AIMS also recommends for monitoring of critical parameters as per the norms of Integrity Operating Window (IOW). Asset integrity has primarily two major factors like new facilities and upgrading integrity of old facilities. The implementation of RBI & RCM in few Refineries has been adopted to improve the reliability of existing units.
Integrity Management – RCM of Process Plant

Author: - Mr. Sheelesh Mehta
Sr. Domain/ Functional Consultant – Asset Performance Management
Wipro Technologies, Bangalore (India).

Abstract:

Process Flow of RCM is in various steps like: Identify Critical Equipment, Identify Functions & Functional Failures, List failure modes and Failure Effects, Evaluate Consequences of Failure, Identify effective maintenance tasks and fix task intervals, prepare new set of maintenance procedures, upload revised procedures to SAP, Assess maintenance organization- fix roles & responsibilities, Assess competency levels-identify areas for skills improvement, implementation plan, develop monitoring system-KPIs, Audit performance Against Goals (KPI) and Revise/ review critically and RCM analysis as necessary.

Asset Efficiency Optimization and Client Need Analysis process

Author: - Mr. Rahul Eknath Deshpande
Sales & Marketing for Industrial Markets
SKF Reliability Services, Pune (India).

Abstract:
In today’s maintenance world, there is no end to Tools available for increasing Reliability. But having availability of too many tools/soft wares incidentally also means that the real need is not yet fulfilled.

Having holistic approach of ‘Asset Efficiency Optimization’ (AEO) process ensures to cover every facet of maintenance management process i.e. from Strategy to Execution. It is also imperative to have right Assessment done before we start with any remedial action. SKF AEO is Maintenance Management process covering Strategy, Work Identification, Work control and Work Execution dimensions of Maintenance management. It also has closing loop with feedback mechanism incorporating ‘Living program’ to have dynamic process to address the ever changing requirement.

The basis to start with AEO is Scientific ‘Client Need Analysis’ (CNA) process. It focuses on finding right action plan with benchmarking and serves as right diagnosis tool before prescribing any action. CNA is a detailed assessment of Asset Management practices in process industry.

Living with Defects: Replace/Repair or prove Fitness-For-Service?

Author: - Mr. Ron Selva
B.Sc, C.Eng, F.I.Mech.E
PP SIMTECH Solutions Limited

Abstract:
When oil, gas, petrochemical or power generating plant items are replaced or repaired simply because, for example, the corrosion allowance has been used up, or some minor cracking has been detected or material property changes and/or metallurgical degradation are suspected due to active Damage Mechanisms (DMs), the cost implication to the operating companies is enormous. With the availability of established proven Fitness-For-Service assessment technologies, for example BS-7910 and API-579, rejection of these items should not be therefore necessarily automatic. By this principle, an item is considered to be fit for the intended service, if it can be demonstrated (with acceptable safety margin) that the conditions to cause failure is not reached within a predetermined time period, giving due regard to its DMs induced integrity risk and the HSE and Business consequences of failure.

Application of Fitness-For-Service (FFS) technologies based on knowledge of active & potential DMs and their root causes, along with best-practice RBI technology is changing the way in which such decisions are made to optimize spend, whilst enhancing safety & reliability. This holistic approach to asset integrity management ensures delivery of the 5 strategic goals aimed for by plant sites:- [1]. Desired operational reliability between inspection turnarounds (TAs); [2]. Desired optimum plant run-length time between each equipment; [3]. Maximum cost effective life out of aging equipment; [4]. Optimum spend on CapEx and RevEx.

The FFS assessment can be carried out using BS-7910 and/ or API-579, irrespective of the original design code. The assessor may also to refer to the equipment design codes, e.g. ASME-VIII and/or British standard BS 5500. The scope of FFS Application includes all types of pressure vessels (reactors, distillation columns, absorbers, strippers, reformers, fired heaters, heat exchangers); storage tanks; utility plant items such as boiler drums, de-aerators, headers; piping and pipelines.

Depending on the reasons for the FFS assessment, the output may include one or more of the following - tolerable corrosion/erosion damage sizes & damage rate; tolerant crack sizes & growth rate; remaining life, integrity operating limits & other risk mitigating measures; design improvements; suitable NDT methods. The Output of an FFS assessment becomes an input to RBI team study to formally determine whether - to run the item as it is and at what optimum inspection interval; to monitor the defect and at what monitoring frequency; to repair / replace item and decide when it should be carried out; to revise operating conditions; and to modify design or upgrade material. These decisions (a combination of these actions) will be influenced by the RBI study output such as the Risk profiles of the applicable DMs and the respective HSE and Business Consequences of Failure.

This paper presents a holistic approach incorporating Fitness-For-Service (FFS), Risk Based Inspection (RBI) and NDT to successfully demonstrate integrity of aging or new plant items, affected by one or more DMs. Examples are given to illustrate the substantial benefits of FFS application in conjunction with RBI and advanced NDT, where this combined technique has saved considerable sums of money for the plant operators, whilst enhancing safety and reliability.
“Fitness for service assessment of Above Ground Storage Tank – Application of Risk Based Inspection.”

Author: - Mr. Santanu Saha
Technical Manager
Intertek-Inspec, Sharjah (UAE).

Abstract:
Corrosion of aboveground storage tank bottom plates is a common damage mechanism found in several Petroleum storage tanks in the Middle East countries and in the world at large. Corrosion of the floor plates can occur either from the underside (soil side) or from the top side (product side). Both types of corrosion is common in the storage tanks and eventually lead to metal loss and ultimately perforations in the tank floor. The consequence of such failures are sometimes severe with respect to loss of containment, possibility of explosion and loss of human lives and damage to the environment.

The accumulation of water at the bottom of storage tanks is a primary prerequisite for development of corrosion. On the other hand, soil side corrosion from underside the floor plate sometimes plays a predominant role in the premature loss of product and failure of the tank in service. Although the product side of the floor plates are generally protected with various types of non-corrosive paint coatings and there are several protective measures including cathodic protection and use of dry compacted sands with chemical inhibitors were existent to protect the soil side of the floor plates, several failures of bottom plates in terms of through holes and/ or severe corrosion of the bottom plates almost reaching down to the minimum allowable thickness have been noticed in quite a few cases.

It has been noticed that in many cases the soil side (underside) corrosion occurred mostly at or near the annular plates particularly in the critical zones inside the tank. However in some cases, the corrosion was observed near or at the central sump locations. In a few other cases, product side corrosion were also observed mostly because of paint coat failure resulting in blisters and subsequent corrosion of the plates. Although corrosion of shell plates is uncommon or very rare, in one or two cases shell course through holes resulting from corrosion from an attachment weld were also observed. In this present case study, an above storage tanks which was taken out of service for scheduled maintenance and inspection, several through holes and corrosion have been observed in the bottom plates and one area in the shell plate and an assessment of fitness for service have been carried out based on Risk Based Inspection in accordance with the guide lines of API RP 580 & 581. A general recommendation have been provided based on RBI study and API 653 recommendations.

“IOCL’s experiences with Fracture mechanics based Fitness For Purpose assessment of static equipment through a few case studies”

Author: - Dr. Sova Bhattacharya
Chief Research Manager(Metallurgy Department)
IOCL R&D, Faridabad (India).

Abstract:
Component integrity is of prime importance not only from the point of view of maintaining continuous production but also from the point of view of safety and environmental hazards. In an operating plant, periodic inspection by various techniques, failure analysis and condition monitoring forms the basis for identifying the nature and extent of damage and its progress over a period of time. Once damage is identified, it becomes necessary to establish to what degree it can be tolerated so that timely corrective actions can be initiated. With a given degree of damage, the component has to be assessed for its Fitness For Purpose (FFP) and then its Remaining Life Assessment (RLA) before repair or replacement becomes necessary.

Compared to other industries, refining Industry encounters complex operating conditions with respect to Temperature, Pressure as well as aggressive environments which often results into premature failures and plant interruptions. We in the Refining Industry, have addressed these problems over past twenty years through development of advancedmethodologies and software based on damage mechanisms & Fracture mechanics principles. Ever since the self-reliance have been achieved on RLA & FFS activities and the group is continuously working towards betterment of the technology and methodologies to counter the aging of components and their Life extension. Through this paper we would like to take recourse into some of the vital aspects on the subject and present few case studies wherein the in-house developed technology and software have been successfully applied to take run, repair and re placement decisions on running components.
“Integrity Management of Pipeline Networks - RBI of Pipelines”

**Author:** Mr. John Eapen  
Head of Asset Integrity  
DNV-GL India.

**Abstract:**  
Pipeline RBI involves first dividing the pipeline into different sections. To each section different threats are allocated as follows:  
- **Internal Corrosion:** Refers to loss of pipeline material from the internal surface of the pipe by chemical reaction with its content or by microbial activities. Corrosion mechanisms depend on fluid contents and environmental conditions, but could include CO2 corrosion, O2 corrosion (dew point corrosion), Microbial corrosion, under deposit corrosion, H2S damage (pitting, SSC,…).  
- **External Corrosion:** Refers to removal of pipeline material from the external surface of the pipe due to interaction with the material surrounding the pipe (e.g. terrain or air). It can manifest itself as general metal loss and/or localized pitting.  
- **3rd Party Damage:** Refers to accidental damage caused to the pipeline structure due to interference from unauthorized personnel. Includes threats associated with traffic exposure, digging, vandalism etc.  
- **Outside Force:** Refers to natural forces imposed on the pipeline beyond its design specification, which threatens the serviceability or causes damage to the pipeline structure. Includes threats such as instability of slopes, settlement or erosion of soil, seismic activity, etc. Material Failure refers to inadequacies in the pipeline design, fabrication, installation and quality assurance procedures. Equipment Failure focusing on “equipment” associated with the pipeline. Specifically, focus is on pressure containing equipment such as valves, pigging facilities etc. (not ancillary equipment such as monitoring devices, cathodic protection equipment. Incorrect Operation means Pipeline failure due to errors made during operations or maintenance. Includes: Pipeline design & operation aspects, Physical environment aspects, Human aspects.  

Consequence of failure is assessed for each threat which broadly covers the Safety (or personnel), Environmental, Financial (or asset) and Reputation. Probability of failure is assessed for each threat. Based on this the risk is assessed for each section of the pipeline using the following typical risk matrix. Based on the risk calculated an inspection strategy IMP is recommended for each section of the pipeline.

“Way Forward for Implementation of RBI & IOW”

**Author:** Mr. S. Ghatak Chaudhuri  
Ex. Deputy General Manager(M&I)  
IOCL

**Abstract:**  
Reliability improvement attains highest importance in process plant specially refineries, petrochemicals, fertilizers etc. primarily because of high consequence. For improving reliability industries have taken up initiatives for implementation of Risk Based Inspection (RBI) and Reliability Centered Maintenance (RCM). Although the initiatives have given rich dividend to the industries but difficulties faced during such implementation need to be addressed for future smooth and faster implementation.

Such high technical issues need to be understood properly before starting the implementation. Therefore, areas needing attention for successful implementation was deliberated and to mention few as follows:

1. Coverage of all equipment  
2. Coverage of small bore piping  
3. Development of standard monitoring and control of critical parameters as per IOW  
4. Development of isometrics including injection points, dead ends and mixing points  
5. Optimization of task selection  
6. Integration with existing work flow system like SAP  
7. Knowledge transfer and retention of skill.

With the proper understanding of importance of key issues and proper wisdom the future implementation can be made more efficiently by the industries.
3rd ICEPIM
3rd International Conference & Exhibition on “Pipeline Integrity Management”
19-20 Jan 2017, Mumbai
www.pipelineintegritymanagement.in

IWM 2017
National Summit on Industrial Water Management - to Control Corrosion, Scaling, Fouling and MIC
14-15 April 2017, New Delhi
www.industrialwatermanagement.in

CPS 2017
2nd Cathodic Protection Summit
23-24 June 2017, New Delhi
www.cathodicprotectionsummit.com

National Conference on Coating, Lining & Surface Treatment in Oil, Gas, Power & Infrastructure Sector
23-24 June 2017, New Delhi
www.matcorrconsultancy.com

AIM 2017
International Conference on “Asset Integrity Management”
18-19 August 2017, New Delhi
www.assetintegritymanagement.org

RBI 2017
2nd International Conference on “Risk Based Inspection”
18-19 August 2017, New Delhi
www.riskbasedinspection.org

Indian Society for Non Destructive Testing (ISNT) is a professional body of NDT practitioners, equipment suppliers, service providers, academicians and students and function with the following objectives:

- To further the cause of science and technology of NDE.
- To help Indian Industry through result of research and development of NDE.
- To organize professional courses / workshop / seminars in various field of NDE and to create forums for exchange of information & ideas among the NDE practitioners & professionals.
- To promote the use of approved international and national standards in NDE and related areas by Indian industry in consultation with the Bureau of Indian Standards.
- To help in preparation of new Indian standards and updation of old standards in NDE.
- To cocoordinate with universities, academic institutions and Government bodies for initiating new projects on the development of various NDE techniques.
- To interact and co-coordinate with other National associations and NDE societies from other Countries.
- To conduct training and certification courses in NDE techniques.
- To propagate the culture of quality to promote NDE for enhanced production and reliability, and to accelerate the introduction of new NDE methods.
- To aid Indian industries to compete in the world market and export a diverse range of engineering products of proven quality and standard.
PP SIMTECH - the global leader in delivering RBI technology implementation support

- Our robust RBI technology process is a proven user-friendly methodology which exceeds guidelines issued by API 580 and Health & Safety Executive (HSEx) – UK government regulatory body for pressure equipment integrity.
- Combined with our comprehensive team study process, it is unparalleled in its application delivering sustainable improvement in reliability & safety of plant items, whilst achieving the financial benefits linked with RBI.
- Successfully proved against rigorous RBI audits by HSEx at plant sites.

Discover the major breakthrough in RBI technology application for yourself and the difference this leading edge of RBI best-practice can bring to your company

PP SIMTECH and BP seal their development partnership by signing the Agreement for PP SIMTECH's unparalleled RBI Technology process and supporting software system rbiAsyst™ making it available to all BP sites worldwide.

What our clients say.....

One of our global clients in their published news article stated ..... “Our RBI technology is unparalleled in its application for its technical content, engineer-friendliness and practicality for implementing & managing it at plant site.”

We deliver total confidence to the decision makers involved with implementing the RBI outcome

PP SIMTECH - striving to be a new best in RBI driven Technical Support Services

- Best-practice RBI implementation for new or older plants
- Inspection plan based on Damage Mechanisms risks
- Fitness-For-Service (FFS) & Remaining Life assessments
- Assessment and advice on scope of Root Cause Analysis
- Root Cause Failure Analysis & mitigation recommendations
- RBI or Damage Mechanisms assessment at design stage of plants
- Evaluation of Damage Mechanisms based Operating Limits
- Advice on need for repair / replacements / material upgrade
- Training - RBI, FFS (API 579) and API 571 Damage Mechanisms
- Optimum test interval for PRVs based on Criticality Assessment

We are renowned for the application of these state of the art proven integrated technologies which support cost effective Integrity Management of equipment operating in the oil, gas, petrochemical & fertilizer industries.

Equipment covered: Vessels including reactors, crackers, heaters, strippers, distillation columns, heat exchangers, drums, absorbers, separators, headers, reformers, boilers, piping, storage tanks, pipelines, PRVs and utility plant equipment

Our engineering solutions are innovative, practical & second to none as we focus on best interests of our clients

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