Three Rivers Systems Development Company

World Leaders in RBI Technology
<table>
<thead>
<tr>
<th>Year</th>
<th>Project Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>Petrochemicals Plant</td>
</tr>
<tr>
<td>1989</td>
<td>Oil Refinery</td>
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<tr>
<td>1989</td>
<td>Oil Production</td>
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<tr>
<td>1989</td>
<td>Gas Production</td>
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<tr>
<td>1992</td>
<td>Storage Tanks</td>
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<td>1994</td>
<td>FPSO</td>
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<td>1997</td>
<td>Pipeline Network</td>
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<td>1998</td>
<td>LNG Plant</td>
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<tr>
<td>2001</td>
<td>Thermal Power Plant</td>
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</tbody>
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T-OCA Users by Industry

- Refineries
- Chemicals
- Oil & Gas Production
- Pipelines
- LNG
T-OCA Principles

- T-OCA provides semi-quantitative, rule based probability and consequences of failure analysis
- It includes qualitative and quantitative assessment.
- It uses a 3x3, 4x4, 5x5 or 6x6 Risk Matrix
- It includes TaskMaster module for inspection plan development
• The T-OCA home Screen includes an Asset Tree View
The Asset Tree can be expanded to component level.
The Asset Tree includes a traffic light system.
Navigation

- Right click on an asset to Change, Delete, View, Copy or Rename an asset. Also go to TaskMaster for inspection planning.
T-OCA can import from or export to Excel spreadsheets.
Software Configuration

- T-OCA can be configured to user requirements
T-OCA administrator can define user levels and user rights
RBI Implementation with T-OCA

- T-OCA implementation follows a simple step by step process to complete the RBI analysis
- T-OCA contains both probability of failure models and consequences of failure models that automatically calculate probability of failure and consequences of failure based on process stream composition, system operating conditions and materials of construction
Initial Assessment

The initial assessment is calculated by:

1. Define process streams
2. Define process systems (corrosion loops)
3. Perform qualitative assessment of systems and define Integrity Operating Windows
4. Assign piping and equipment to systems
5. Enter or import piping and equipment data
6. Calculate Damage Mechanisms, Probabilities, Consequences and Risk
- T-OCA organizes data and work on a Production Unit or Plant Basis
The RBI assessment begins with the defining of the process streams.
After process streams, process systems (aka corrosion loops) are defined and piping and equipment are assigned to the system.
Process systems (corrosion loops) carry a number of properties that are inherited by equipment belonging to the system.
Risk Models (1)

- Classic T-OCA has used a 3x3 risk matrix for over 20 years
T-OCA now offers 4x5, 5x5 (below) or 6x6 risk matrices.
T-OCA Classic Model

- T-OCA Classic Risk Model uses 8 Consequences Factors and 12 Failure Mode Categories

![T-OCA Classic Model Diagram](image)
Additional Files

- Additional files may be attached to equipment records and opened within T-OCA
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Calculate Initial assessments

- After completing process streams, process systems, data entry/import and qualitative assessment, T-OCA automatically calculates the initial assessment.
Plant Integrity Review (PIR)

- Following the initial risk assessment, the PIR is used to input inspection results and make changes to the calculated values.
- PIR is used to store the current assessment in an archive so that changes may be tracked over time.
- For a newly built plant, PIR may not be necessary and the inspection planning can be based on the initial assessment.
- For any other plant, the PIR process allows inspection data and other knowledge to modify the assessment.
The materials tab is used to change or validate materials data.
The process tab is used to change or validate system and process data.
The inspection tab is used to include measured corrosion rates and inspection dates.
PIR Consequences (Classic)

- The consequences tab is used to change the calculated consequences.
The consequences tab is used to change the calculated consequences.
The probability tab is used to change the calculated probability of failure.
PIR Additional Data

- Reports, photographs, drawings and spreadsheets may be attached to the database before the PIR is completed.
Inspection Planning (TaskMaster)

- TaskMaster is used to complete the inspection planning once the assessment is complete.
- TaskMaster is based on building a list of standard tasks with associated intervals and then building a set of rules based on risk that are used to attach tasks and intervals to the equipment and piping.
- TaskMaster can calculate the inspection schedule if the inspection completion dates are included.
TaskMaster Tasks

- Tasks are standard activities with associated methods and intervals
TaskMaster Rules

- TaskMaster rules associate tasks and intervals with equipment. Rules can be built individually or by the use of a matrix.
TaskMaster analytical tools can show the distribution of intervals for any Task.
TaskMaster Results

- TaskMaster analytical tools can show the distribution of due dates for any Task
From the TaskMaster review form, the work can be scheduled and methods assigned.