

AWARE

APM RBI & IDMS TECHNICAL CAPABILITIES GUIDE

Our cutting edge and technologically advanced solutions help companies maintain equipment reliability and safety, determine equipment remaining useful life estimations, and manage inspection data.

AIM System

Asset Integrity Management System covering:

- Corrosion Management
- Risk-Based Inspection (RBI) for static equipment, piping, and PRD
- Anomalies Management
- Temporary Repair Management
- Root Cause Analysis (RCA)
- Structural assets, including tracking cracking
- Integrity Operating Window
- Data migration from existing database systems
- Training on the use of the supplied system

Aware

- Complete Asset Tracking & Analysis – design, reference, and inspection data for:
 - Piping
 - Pressure Vessels
 - Tanks
 - Valves
 - PRDs
 - Etc.
- Corrosion Monitoring and Trending
- Integrated Risk Based Inspection Software (API 580/581 compliant)
- Inspection Scheduling and Turnaround Planning
- Anomalies and Repair Tracking

Corrosion Management System (Pressure Parts)

KeyAware has a very sophisticated built-in corrosion management system. It stores and tracks corrosion monitoring locations (CML), for thickness, inspection dates, and retirement dates on any type of static equipment or component. It calculates minimum allowable wall thickness (T-min) and corrosion rates.

At any time, users have a clear idea of the status of their assets with a click of a button.

- Where thinning rates or thickness measurements have been conducted in the previous inspections, the data will be used to calculate the corrosion rate, as this output is more accurate than estimating corrosion rates by predictive corrosion modelling

- Where thinning rates or thickness measurement are not available, then either predicted corrosion rates (using industry standard software) or known corrosion rate values from equivalent systems elsewhere will be used

Aware calculates the Allowable Minimum Thickness (T-min) for all asset types and provides a clear basis for the performed calculations.

There are 7 different criteria utilized to evaluate the next inspection date including:

- Code Interval
- Override Interval
- Half-Life
- Remaining Life
- Out-of-Service
- RBI
- User Override

Risk-Based Inspection (Pressure Parts)

RBI provides a prudent assignment of resources to assess and maintain equipment technical integrity based on their risk levels.

Moreover, API 510, 570 and 653, for pressure parts (pressure vessels, piping, and tank, etc.) Inspections have identified the value of RBI for this equipment in terms of determining inspection strategies as well as inspection intervals.

It emphasizes that these RBI assessments must be reviewed for any changes in risk, at least every 10 years, or more often, as changes occur with respect to equipment design.

The intent of implementing RBI methodology is to allow industry to efficiently manage static equipment integrity and reliability.

It provides the basis for managing risk by making a calculated decision on inspection frequency, level of detail, and types of NDE.

In most cases, a large percent of the total unit risk will be concentrated in a relatively small percent of the items.

These potential high-risk components may require greater attention, may be through a revised and comprehensive inspection plan.

Intertek AIM uses our Aware software and the RBI module of its inspection management database system.

The Intertek AIM RBI software module provides for an approach to RBI assessment using API 580/581 for guidance.

Our software has been applied to drilling platforms, production platforms, refineries, chemical plants, gas plants, and petrochemical facilities worldwide.

Over 35 major companies have used our software products to implement RBI and IDMS programs.

The software provides a means to evaluate each major component of a fixed equipment asset (i.e., channel, shell and bundle for shell and tube exchangers), piping circuits and relief devices.

The program is fully contained and can analyze vessels, piping, and PRDs.

Vessels generally will include columns/towers, filters, drums, shell and tube exchangers, air coolers, storage tanks, etc.

All columns/ towers can be separated into components such as top, middle, and bottom, with the ability to analyze sub-components that may include nozzles, heads, etc.

The Aware software is robust and easy to understand. It calculates the consequence of failure (COF) and the likelihood of failure (LOF) of components and sub-components and provides a risk ranking for each.

Based on the risk ranking and inspection strategies developed for to address potential damage mechanisms, inspection plans are developed for each equipment item.

Risk for an equipment/ component is calculated based on the highest LOF and COF assessed among all the identified degradation mechanisms.

Intertek AIM will use the 5x5 risk matrix compliance with API 580/581.

Aware has been excessively used for Risk Based Inspection implementations.

Aware fully supports the latest risk-based standards as specified in API 581 (quantitative) and API 580 (semi-quantitative) recommendations including planning tools for pending and scheduled tasks with a dashboard for ease in monitoring.

Aware accommodates both Level 1 and Level 2 RBI implementations.

Aware also supports a fully qualitative risk evaluation, based on Health & Safety, Environment, Cost, and Damage Mechanism categories along with COF, LOF and risk.

Inspection plans in Aware are generated based on asset type, damage mechanisms, COF, LOF and overall risk scoring.

The RBI-based recommendations are configurable according to API standards, Intertek experience and recommendations or customer-defined.

Damage mechanism can be defined based on available (pre- configured) list or new ones can be added.

Manage Structural Assets

Aware supports asset management on structures in an integrated environment. Structural assets can be broken down (like pressure parts) into a logical hierarchy as shown below.

For each of the assets (truss, decks, handrails, gratings, platforms, Cargo tanks, Ballast tanks, etc.) users can document, track and plan actions and status.

Aware automatically provides the inspection due dates based on inspection intervals as shown below.

Aware provides for documenting details including findings, recommendation, status severity and priority (Risk-based approach) with associated pictures as shown below.

Monitoring for cracks is one of the main objectives for these inspections.

Eddy Current tests are done at pre-determined intervals (3 years) and once this frequency is applied, Aware will track and alert users of upcoming (or past due) inspections.

As an example, a crack once detected using ACFM is documented (length, depth) in Aware along with the pictures as shown below.

The recommendation was for an engineering review to determine the criticality of the weld and develop a plan to address the indication.

Like Pressure Parts, anomalies for structural assets are tracked and instant reports/ metrics are available as shown below.

Integrity Operating Window

The main goal for Aware IOW module is to provide a mechanism to monitor dynamic risks for your critical assets and identified damage mechanisms.

This helps reduce failures and improves reliability.

The IOW module calculates the probability of failure and sends out notifications to concerned personnel with recommendations.

The principal industry guideline for developing Integrity Operating Windows (IOWs) in Aware is the American Petroleum Institute (API) publication API 584 Integrity Operating Windows.

This publication includes information such as:

- IOW: definitions, types, and terminology
- Guidelines for: creating, documenting, and implementing IOWs
- Data and information for the program development
- Monitoring IOWs
- Actions and procedures for when an IOW is exceeded
- Reviewing and updating existing IOW programs
- Integration these programs with other safety practices

Software solutions for your facility inspection data management and Risk-Based Inspection (RBI) needs

The document is generally accepted providing the recommended methodology for developing an IOW program for a facility.

Intertek has worked with this publication since its submission for ballot by the API committee and prior to its publishing.

IOW implementation is supported in Aware.

Users can define/ setup the following for IOWs:

- IOW#: Unique ID
- Reference Corrosion Loop/ Drawing
- Corrosion Loop Number(s)
- Equipment or Piping Circuit
- IOW Monitoring Description
- IOW Monitoring Input Type (Historian, DCS, Equipment Status, Inspection Report, Walk Down, Sampling, etc.)
- IOW Monitoring frequency
- IOW Monitoring Tags
- IOW Monitoring limits (High, Medium High, Medium, Low, None)
- Relevant Damage Mechanism(s)
- History of IOW notification maintained

As an option, the IOW module is capable to utilize real-time data from historians to drive IOW & envelopes.

Tracking Anomalies with Aware

Aware supports creating and tracking anomalies effectively.

For each anomaly, Aware tracks:

- Priority (Pick Lst)
- Required Action (Pick List)
- Recommendations (Long Text)
- Status (Pick List)
- Required Action Date (calculated based on priority)

Enhance Anomaly Management & Risk Assessment Support

REQUIREMENT	STATUS
Cnspectors and technicians should be able to enter enough details for any anomaly.	Supported
System should have the capability to link associated P&IDs, isometrics, pictures etc. to every piece of asset (line, vessel, tank, etc.) These should be available as part of the work pack. This also means that anomalies have their associated P&IDs and isometrics readily available.	Supported
Other design information like class, material, pressure, etc. should be available	Supported
Capacity to carry out a mitigated risk assessment and make recommendations. Calculations EDTF based on EDTF frequency. User will be able to change frequency.	will be Supported
Dashboard (Hub) list all the anomalies along with key parameters.	Supported



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