

API RBI User Group

Base Resource Document (BRD) Rewrite – API 581

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Lynne C. Kaley
The Equity Engineering Group, Inc.
Houston, TX USA

Purpose

- Official technical documentation of API RBI methodology
- Consistent with V8+ software – will be updated as necessary with future software releases
- Modular format for easy updates and distribution
- Documentation will be the basis for any regulatory acceptance activities
 - US acceptance in progress
 - Working with RIMAP
- Acceptance will follow API 579 acceptance approach

BRD Outline

- Part 1 - Overview of Risk (TBD)
 - Calculation of Risk as a combination of POF and COF
 - Inspection Planning using time stamping
 - Presentation of results, Risk Matrix (area and financial) – introduce user specified POF and COF category ranges
 - Risk Calculations for Vessels, Piping, Tanks, Bundles and PRDs
 - Part 1, Annex A - Details of PRD
- Part 2 - POF
 - POF calculation (168 pgs.)
 - Part 2, Annex A - Management Score audit tool (22 pgs.)
 - Part 2, Annex B - Corrosion rate determination (105 pgs.)
- Part 3 - COF
 - COF calculation(111 pg.)
 - + Level 1 (old model) step-by-step procedure
 - + Level 2 (new modeler) detail of steps necessary to calculate consequence
 - + Tank model consequence calculation
 - Part 3, Annex A - Detailed background of Level 1 and Level 2 consequence modeler (31)

Part 2 - POF

1. SCOPE
2. REFERENCES
3. DEFINITIONS
4. PROBABILITY OF FAILURE CALCULATIONS
 - 4.1 Overview
 - 4.2 Calculation of Probability of Failure
 - 4.3 Generic Probability of Failure
 - 4.4 Damage Factor
 - 4.4.1 Overview
 - 4.4.2 Damage Factor Combination for Multiple Damage Mechanisms
 - 4.4.3 Inspection Effectiveness Category
 - 4.5 Management Systems Factor
 - 4.5.1 Overview
 - 4.5.2 Management Systems Evaluation Factor
 - 4.5.3 Nomenclature
 - 4.5.4 Tables
5. THINNING DAMAGE FACTOR
6. COMPONENT LINING DAMAGE FACTOR
7. -15. SCC DAMAGE FACTOR
16. - 19. EXTERNAL CORROSION DAMAGE FACTOR
20. HTHA DAMAGE FACTOR
21. - 24. BRITTLE FRACTURE DAMAGE FACTOR
25. PIPING MECHANICAL FATIGUE DAMAGE FACTOR

Part 2 - POF

5. THINNING DAMAGE FACTOR

5.1 Scope

5.2 Screening Criteria

5.3 Required Data

5.4 Basic Assumptions

5.5 Determination of the Damage Factor

5.5.1 Overview

5.5.2 Inspection Effectiveness

5.5.3 Calculation of the Damage Factor

5.5.4 Nomenclature

5.6 Tables

5.7 Figures

Part 2 Annex B – Determination of Corrosion Rates

B.1 Overview

B.1.1 Determination of Corrosion Rates

B.1.2 Determination of Thinning Type

B.1.3 Tables

B.2 HYDROCHLORIC ACID (HCL) CORROSION

B.2.1 Description of Damage

B.2.2 Basic Data

B.2.3 Determination of Corrosion Rates

B.2.4 References

B.2.5 Tables

B.2.6 Figures

- Reported corrosion rates are interpolated from mid-point, without ranges

Part 3 - COF

1. SCOPE
2. REFERENCES
3. DEFINITIONS
4. GENERAL
 - 4.1 Overview
 - 4.1.1 Consequence Categories
 - 4.2 Overview of Consequence Analyses in API RBI
 - 4.2.1 Level 1 Consequence Analysis
 - 4.2.2 Level 2 Consequence Analysis
 - 4.3 Consequence Analysis for Storage Tank Bottoms and Shell Courses
 - 4.4 Consequence Analysis Calculation Procedure
 - 4.5 Area and Financial Based Consequence Analyses
 - 4.6 Use of Atmospheric Dispersion Modeling
 - 4.7 Tables
 - 4.8 Figures
5. LEVEL 1 CONSEQUENCE ANALYSIS
6. LEVEL 2 CONSEQUENCE ANALYSIS
7. CONSEQUENCE CALCULATIONS FOR ATMOSPHERIC STORAGE TANKS

Part 3 – COF Level 1 & 2

5. LEVEL 1 CONSEQUENCE ANALYSIS

- 5.1 Determine the Representative Fluid and Associated Properties
- 5.2 Release Hole Size Selection
- 5.3 Release Rate Calculation
- 5.4 Estimate the Fluid Inventory Available for Release
- 5.5 Determine the Release Type (Continuous or Instantaneous)
- 5.6 Estimate the Impact of Detection and Isolation Systems on Release Magnitude
- 5.7 Determine the Release Rate and Mass for Consequence Analysis
- 5.8 Determine Flammable and Explosive Consequences
- 5.9 Determine Toxic Consequences
- 5.10 Determine Non-Flammable Non-Toxic Consequences
- 5.11 Determine the Component Damage and Personnel Injury Consequence Areas
- 5.12 Determine the Financial Consequences
- 5.13 Nomenclature
- 5.14 Tables
- 5.15 Figures

Part 3 – COF Tanks

7. CONSEQUENCE CALCULATIONS FOR ATMOSPHERIC STORAGE TANKS

7.2 Release Hole Size Selection

7.3 Release Rate Calculation

7.3.1 Overview

7.3.2 Tank Shell Course

7.3.3 Tank Bottom

7.3.4 Calculation Procedure – Tank Shell Course

7.3.5 Calculation Procedure – Tank Bottom

7.4 Estimate the Inventory Volume Available for Release

7.4.1 Overview

7.4.2 Calculation Procedure – Tank Shell Course

7.4.3 Calculation Procedure – Tank Floor

7.5 Determine the Type of Release

7.6 Estimate the Impact of Detection and Isolation Systems on Release Magnitude

7.7 Determine the Release Rate and Volume for the Consequence Analysis

7.7.1 Overview

7.7.2 Calculation Procedure – Tank Shell Course

7.7.3 Calculation Procedure – Tank Bottom

7.8 Determine Flammable and Explosive Consequences

7.9 Determine Toxic Consequences

7.10 Determine Non-Flammable Non-toxic Consequences

7.11 Determine Component damage and Personnel Injury Consequences

7.12 Determine the Financial Consequences

7.12.1 Overview

7.12.2 Calculation Procedure – Tank Shell Course

7.12.3 Calculation procedures – Tank Bottom

7.13 Nomenclature

7.14 Tables

7.15 Figures

Part 3 Annex A – Basis for Consequence Analysis

A.1 GENERAL

A.2 REFERENCES

A.3 LEVEL 1 CONSEQUENCE ANALYSIS

A.3.1 Representative Fluid and Associated Properties

A.3.2 Release Hole Size Selection

A.3.3 Estimating the Fluid Inventory Available for Release

A.3.4 Determination of the Release Type (Instantaneous or Continuous)

A.3.5 Determination of Flammable and Explosive Consequences

A.3.6 Determination of Toxic Consequences

A.3.7 Nomenclature

A.3.8 Tables

A.3.9 Figures

A.4 LEVEL 2 CONSEQUENCE ANALYSIS

A.4.1 General

A.4.2 Cloud Dispersion Analysis

A.5 CONSEQUENCE ANALYSIS FOR ATMOSPHERIC STORAGE TANKS

A.5.1 Overview

A.5.2 Representative Fluid and Associated Properties

A.5.3 Generic Failure Frequencies and Release Holes Sizes

A.5.3.1 Tank Bottom

A.5.3.2 Shell Courses

A.5.4 Estimating the Fluid Inventory Available for Release

A.5.5 Determination of the Release Type (Instantaneous or Continuous)

A.5.6 Determination of Flammable and Explosive Consequences

A.5.7 Determination of Toxic Consequences

A.5.8 Determination of Environmental Consequences

A.5.9 Tables

Future Needs

- Ballot and comment resolution of Parts 2 & 3 plus annexes
 - Part 2, Annexes balloted to corrosion/materials skill base
 - Part 3, Annexes balloted to consequence analysis skill base
 - + Third party review and reporting/resolution
- Part 1 and Annex – E²G
- Metric conversions in document
- Ballot and comment resolution of Part 1
 - Part 1, Annexes balloted to inspection skill base
- Development of plan and timeline for Parts 2 & 3 ballot

Document Review & Ballot