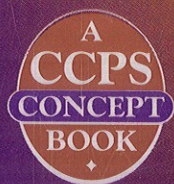


Essential Practices for Managing Chemical Reactivity Hazards

Robert W. Johnson
Steven W. Rudy
Stephen D. Unwin



Contents

| | |
|-----------------------------------|------------|
| <i>Preface</i> | <i>vii</i> |
| <i>Acknowledgments</i> | <i>ix</i> |
| <i>Abbreviations and Acronyms</i> | <i>xi</i> |

1

| | |
|--|----------|
| Introduction and Overview | 1 |
| 1.1. Purpose | 3 |
| 1.2. Need | 4 |
| 1.3. Unintentional/Intentional Chemistry Incidents | 6 |
| 1.4. How to Use This Publication | 11 |
| 1.5. Related Resources | 13 |

2

| | |
|---|-----------|
| Chemical Reactivity Hazard Management | 17 |
| 2.1. Key Considerations for Managing Chemical Reactivity Hazards | 17 |
| 2.2. Life Cycle Issues | 19 |
| 2.3. Existing Management Systems | 25 |
| 2.4. Product Stewardship | 29 |

3

| | |
|---|-----------|
| Preliminary Screening Method for Chemical Reactivity Hazards | 31 |
| 3.1. Intentional Chemistry | 37 |
| 3.2. Mixing and Physical Processing | 41 |
| 3.3. Storage, Handling, and Repackaging | 43 |

4

| | |
|---|-----------|
| Essential Management Practices | 65 |
| 4.1. Put into Place a System to Manage Chemical Reactivity Hazards | 65 |
| 4.2. Collect Reactivity Hazard Information | 71 |
| 4.3. Identify Chemical Reactivity Hazards | 78 |
| 4.4. Test for Chemical Reactivity | 84 |
| 4.5. Assess Chemical Reactivity Risks | 90 |
| 4.6. Identify Process Controls and Risk Management Options | 96 |
| 4.7. Document Chemical Reactivity Risks and Management Decisions | 101 |
| 4.8. Communicate and Train on Chemical Reactivity Hazards | 107 |
| 4.9. Investigate Chemical Reactivity Incidents | 110 |
| 4.10. Review, Audit, Manage Change, and Improve Hazard Management Practices and Program | 113 |

5

| | |
|------------------------------------|------------|
| Worked Examples | 119 |
| 5.1. Intentional Chemistry Example | 119 |
| 5.2. Combustor Example | 120 |
| 5.3. Repackaging Example | 124 |
| 5.4. Physical Processing Example | 128 |
| 5.5. Mixing Example | 128 |
| 5.6. Oxygen System Example | 133 |

6

| | |
|---|------------|
| Future Work on Chemical Reactivity Hazards | 135 |
| 6.1. Inform | 135 |
| 6.2. Communicate | 137 |

| | |
|-----------------|------------|
| Glossary | 139 |
|-----------------|------------|

| | |
|-------------------|------------|
| References | 149 |
|-------------------|------------|

| | |
|----------------------------|------------|
| A-1. Case Histories | 155 |
|----------------------------|------------|

| | |
|---|------------|
| A-2. An Inherently Safer Process Checklist | 167 |
|---|------------|

| | |
|---|------------|
| A-3. Executive Summary of CSB Investigation Report | 173 |
|---|------------|

| | |
|---------------------------|------------|
| Contents of CD-ROM | 185 |
|---------------------------|------------|

| | |
|--------------|------------|
| Index | 187 |
|--------------|------------|