



Identifying Thermal and Reactive Hazards in Manufacturing

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Overview

Introduction

Identification strategies

Tools for reactivity hazard ID

Summary

Common Issues



Reactivity hazards are not explicitly regulated other than the NJ TCPA.



Failure to identify consequences due to reactivity hazards



Inadequate procedures



Inadequate safeguards



Equipment and building design concerns



Emergency preparedness

Reactivity Management Guidance



CCPS



OSHA



EPA

Reactivity Management Guidance per CCPS

- ▶ Implement a system to manage chemical reactivity hazards
- ▶ Collect reactivity hazard information
- ▶ Identify chemical reactivity hazards
- ▶ Test for chemical reactivity
- ▶ Assess chemical reactivity risks
- ▶ Identify and implement process controls and risk management options
- ▶ Document chemical reactivity risks and management decisions
- ▶ Communicate & train
- ▶ Investigate chemical reactivity incidents
- ▶ Review, audit, manage change

Reactivity Hazard Management – Simplified

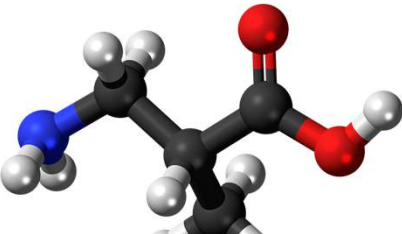
- Process safety information
- Identify hazards
- Evaluate consequences
- Determine safeguards
- Manage change



Identification Strategy



Key Considerations to Identify the Reactive Hazard



Intentional chemistry



Mixing



Hazardous substance

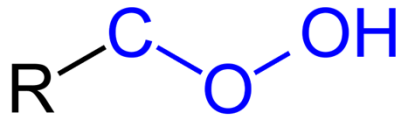


Generates heat



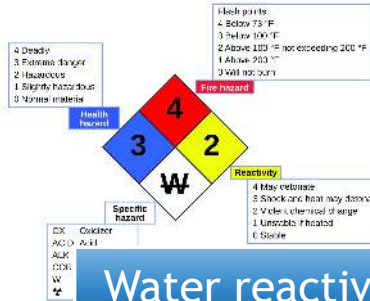
Incompatible

Hazardous Substances



O

Peroxide forming



Water reactive



Oxidizer



Corrosive



Self-reactive

Areas of Consideration



Vessels



Handling



Storage

Evaluate Reactivity

Process Vessels

Runaway reaction scenarios

Overpressure or
overtemperature scenarios

Lack of mixing

Storage Tanks/Drums

Contamination

Corrosion

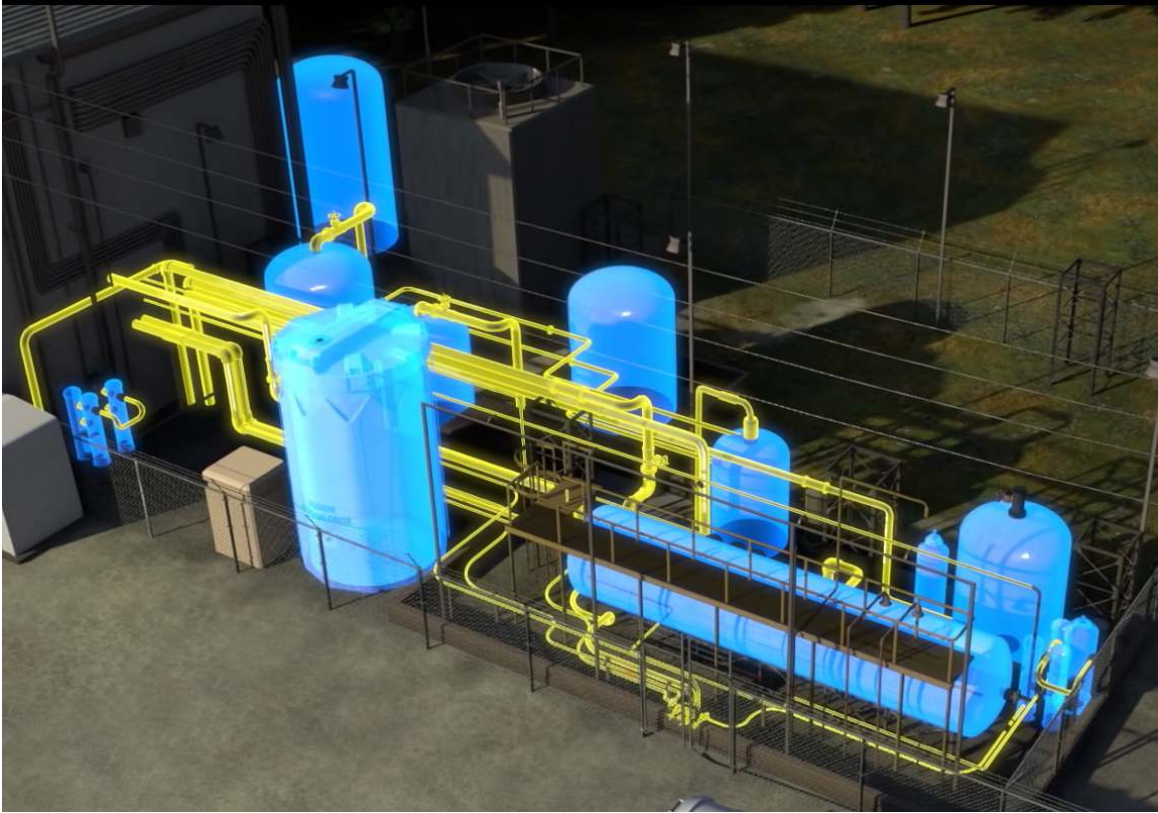
Material compatibility

Handling/Material Transfer

Tank farms

Loading/
unloading
activities

Manual
operations



Tools for Hazard Identification

SDS review

Manufacturer technical
information

Wiley's Guide to
Chemical
Incompatibilities

Chemical reactivity
worksheet/CAMEO

Bretherick's, Handbook
of Reactive Chemical
Hazards

Sax, Dangerous
Properties of Industrial
Materials

Reactors and Process Vessels

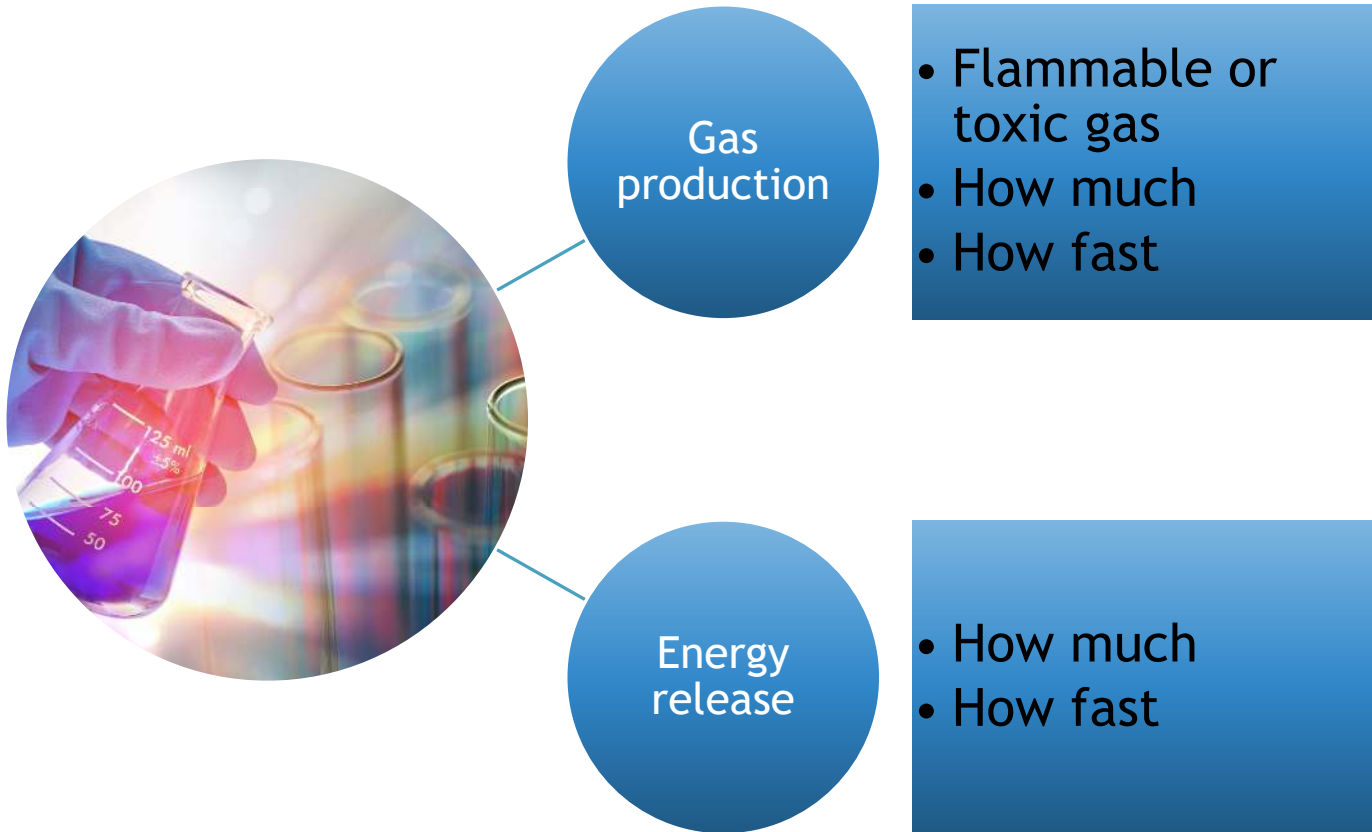
Recipe

Physical properties

Solvent

Rate of addition

Identify Hazards of Reactive and Incompatible Materials



Chemical Reactivity Worksheet/CAMEO

Results can be conservative

Review based on your operation

Limited to 1:1 interactions

Use as first pass screening

NFPA				Chemical Pairs	ACETIC ANHYDRIDE	PROPYLENE OXIDE	SODIUM HYDROXIDE SOLUTION	SODIUM HYPOCHLORITE	SULFURIC ACID
Health	Flammability	Instability	Special	MPGI Compatibility Chart					
3	2	1		ACETIC ANHYDRIDE					
3	4	2		PROPYLENE OXIDE	N	SR			
3	0	1		SODIUM HYDROXIDE SOLUTION	N	N			
				SODIUM HYPOCHLORITE	N	N	N		
3	0	2	No	SULFURIC ACID	N	N	N	N	

Tools for Hazard Identification

NJ TCPA

Chemical reactivity worksheet/CAMEO

Bretherick's

SDS review

				Print Chart					
				Export Chart Data					
				NFPA	Chemical Pairs				
Health	Flammability	Instability	Special	MPGI Compatibility Chart					
				ACETIC ANHYDRIDE	PROPYLENE OXIDE	SODIUM HYDROXIDE SOLUTION	SODIUM HYPOCHLORITE	SULFURIC ACID	
3	2	1							
3	4	2		N	SR				
3	0	1		N	N				
				N	N	N			
3	0	2	No	N	N	N	N		

Handling Considerations

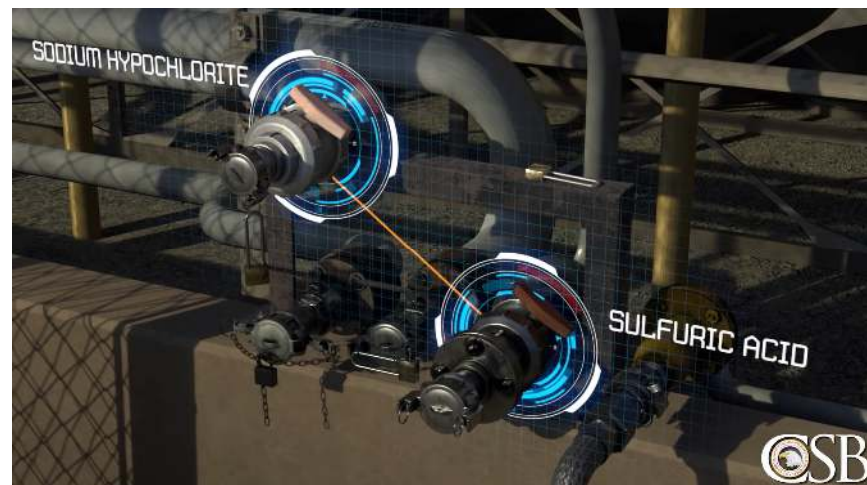
Quantity handled

Raw material handling/control

Inadvertent mixing

Common/shared header

Water reactivity



Identify Reactive Hazards Summary

- Identify hazards chemicals/substances used at the facility
- Obtain physical property and process safety information for the chemicals
- Use tools to identify potential reactive chemical hazards

NEXT STEPS:

- Identify areas where Process Hazard Analysis is recommended
- Identify scenarios for testing to characterize heat and gas



Thank you!

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