A Little Knowledge is a Dangerous Thing

Making the Case for Technical Discipline

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We did not know the basic facts.
Case Study #2
Case Study #2

We knew the facts, but **did not understand** them.

Damaged Pipe
Section between Pump Discharge & Heater Inlet
(8” Sch 10 304LSS)
Case Study #3

We knew the facts, but did not communicate them.
We knew the facts, but forgot them.
Four “Technical” Errors

Type of knowledge errors regarding Unexpected Reactions

1. We did not know the basic facts.
2. We knew the facts, but did not understand them.
3. We knew the facts, but did not communicate them to the extent necessary.
4. We knew the facts, but forgot them.
Purpose:
- To introduce the concept of Technical Discipline
- To identify key components of a Culture of Technical Discipline
  - Standardized Process Development Practices
  - Process Safety & Exothermic Reactions Competency
  - Stage Gate Review system
  - Robust Technology Transfer, Documentation and Training systems
Background

Operational Discipline -

- “A deeply rooted dedication and commitment by each member of the organization to carry out each task the right way, each time.”  
  J.A Klein, DuPont

Technical Discipline –

- Fully identifying and characterizing the chemical and reaction hazards, and
- properly documenting and communicating those hazards
- to create a permanent knowledge of them within the organization operating the process.
Operational / Technical Discipline

Key Knowledge Transfer points

- Plant Operations
- Detailed Design & Implementation
- Safety Review & Concept Documentation
- Initial Engineering Design
- Technology Documentation and Transfer
- Basic Process & Safety Concept Development
- Basic Material Properties and Behavior Data

Operational Discipline

Technical Discipline
Standardized Process Development Practices

- Ensure all pertinent information identified.
- Structured, consistent approach / testing.
- Considers Raw Materials, Products, Side-products, and Residues.
- Considers both Self-Reactivity and Reactions with other materials.
- Defines safe limits for operations, handling & storage.
- Prevents “We did not know the basic facts.”
Technical Competency

- Necessary to interpret hazard information.
- Define roles and responsibilities for each Function.
- Identify technical competencies for each Function.
- Technical competencies include:
  - Basics of Exothermic Reaction Behavior.
  - Design, Scale-up and Safeguarding of exothermic rxns.
- Prevents “We knew the facts, but did not understand them.”
Drives evaluation of reactivity hazards and impact on the safety of the process.

The following reviews should be carried out during the development and implementation process:

1. **Process Development** – application of inherent safety principles
2. **Project / Design Concept** – identification of reactivity hazards
3. **Initial Engineering Design** – countermeasures for control or elimination of hazards
4. **Final Design Check** – detailed review of design to ensure reaction / reactivity hazards are appropriately addressed.
5. **Implementation Confirmation** – PSSR – before start-up, confirm all hazards are controlled.
Documentation, Communication and Training Systems

- Ensures documentation of hazards identified in Process Development.

- **Process Safety Concept** – Documents Hazards and basic safeguards.

- Must be in language native to operating facility.

- Must be reviewed and updated periodically.

- Prevents “We knew the facts, but did not communicate them,” and “We knew the facts, but forgot them.”
Critical Success Factors

- Leadership commitment to provide resources – Personnel and Financial
- Consistency – Do it right, every time
- Experienced Multi-disciplinary Teams
- Discipline! Discipline! Discipline!
Questions?