

Design an Inherently Safer Plant

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Continue to search for ways to build safety into your process — from conceptual through detailed design, to procurement and construction, and even into operation.

Inherently safer design (ISD) evaluations are important for identifying fundamental process improvements that can eliminate hazards or reduce the consequences of plant accidents. They are typically performed at the earliest stages of process design, where changes are most cost-effective. As the detailed design moves into force, inherently safer options are rarely revisited because the designer's emphasis has shifted. Although fundamental changes during later design phases are more difficult, there may still be opportunities to maintain new ideas of inherently safer design. Thus, engineers should continue to look for new mechanisms to improve plant safety throughout the design process.

This article describes some of the tools that can be used to identify these opportunities, provides examples of inherently safer design strategies (i.e., minimize, substitute, moderate, simplify) that can be applied at different points during the design work, and offers guidance on how to apply these concepts during the various risk-assessment studies that are routinely carried out during the design process. As shown in Figure 1, opportunities to incorporate inherently safer features decrease (due to associated costs and other impediments) as the process design evolves from a conceptual idea

to an operating plant. However, it is the process designer's responsibility to employ whatever tools may be available throughout the design progression, as each can provide different, yet valuable, insights.

Conceptual design

The conceptual design phase contains the most opportunities for the identification and incorporation of inherently safer technologies into the process. Identifying these opportunities and making changes prior to detailed design avoids the added costs and schedule delays that would



Figure 1. Opportunities to incorporate ISD into a process and throughout the design activity.

* This article is based on a paper presented at the American Institute of Chemical Engineers 2003 Spring Meeting and 16th Global Congress on Process Safety, Chicago, IL, May 17-18, 2003.

Safer By Design

Yijin Wang



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Table of Contents Safer By Design

1. Understanding the eBook Safer By Design
 - The Rise of Digital Reading Safer By Design
 - Advantages of eBooks Over Traditional Books
2. Identifying Safer By Design
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Safer By Design
 - User-Friendly Interface
4. Exploring eBook Recommendations from Safer By Design
 - Personalized Recommendations
 - Safer By Design User Reviews and Ratings
 - Safer By Design and Bestseller Lists
5. Accessing Safer By Design Free and Paid eBooks
 - Safer By Design Public Domain eBooks
 - Safer By Design eBook Subscription Services
 - Safer By Design Budget-Friendly Options

6. Navigating Safer By Design eBook Formats
 - ePub, PDF, MOBI, and More
 - Safer By Design Compatibility with Devices
 - Safer By Design Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Safer By Design
 - Highlighting and Note-Taking Safer By Design
 - Interactive Elements Safer By Design
8. Staying Engaged with Safer By Design
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Safer By Design
9. Balancing eBooks and Physical Books Safer By Design
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Safer By Design
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Safer By Design
 - Setting Reading Goals Safer By Design
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Safer By Design
 - Fact-Checking eBook Content of Safer By Design
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements

- Interactive and Gamified eBooks

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