



LAYER OF PROTECTION ANALYSIS (LOPA)

Training Instructors

Mr. Hussain Imam Bukhari | Mr. Asad Aleem Khan

Building Competence, Inspiring Confidence



OVERVIEW

Equip participants with a deep understanding of LOPA methodology, from core concepts to advanced applications, enabling them to perform semi-quantitative risk assessments and establish effective independent protection layers (IPLs).

WHY US?

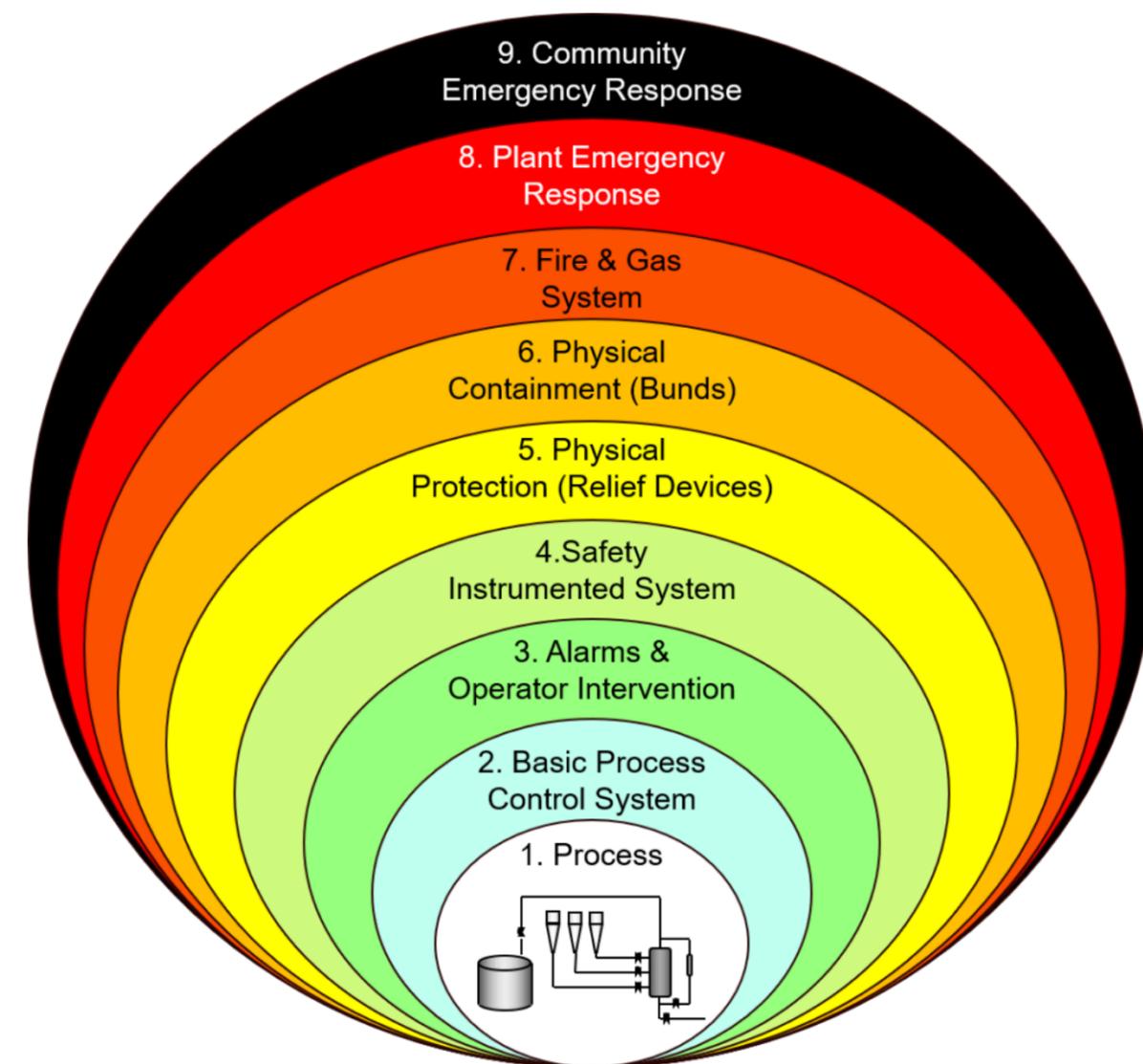
We deliver industry-focused training that empowers professionals and organizations to achieve operational excellence. Each program is customized to client needs, ensuring practical relevance and measurable results.

Our expert trainers bring real-world insights, industrial case studies, sharing their experiences and best practices to every session. We create engaging, actionable learning experiences that bridge the gap between theory and practice.

COURSE OVERVIEW

Learning Outcomes

- Understand LOPA's role in the process safety lifecycle
- Learn to define and identify initiating events and IPLs
- Apply risk tolerance criteria to determine acceptable risk levels
- Conduct LOPA studies integrated with HAZOP and SIL determination
- Develop skills for documentation, facilitation, and reporting



LOPA FUNDAMENTALS

1. Introduction to LOPA

- Definition and purpose as a semi-quantitative risk assessment tool
- Relationship between LOPA, HAZOP, and overall PSM

2. Understanding Risk Assessment & Hazard Identification

- Integrating LOPA into risk management frameworks
- Distinguishing between hazard identification and risk quantification

3. LOPA Methodology

- Step-by-step breakdown of the LOPA process
- Definitions: initiating events, enabling conditions, IPLs, and tolerable risk

KEY ANALYTICAL ELEMENTS

4. Independent Protection Layers (IPLs)

- Criteria: independence, reliability, and effectiveness
- Examples: safety instrumented systems, relief valves, alarms, and procedures

5. Scenario Identification & Analysis

- Selecting credible hazardous scenarios
- Estimating consequences and severity levels

6. Risk Tolerance Criteria

- Establishing quantitative thresholds for acceptable risk
- Using corporate and regulatory benchmarks

7. Initiating Events & Frequency Estimation

- Identifying initiating causes and enabling conditions
- Quantifying event frequencies using operational data

CALCULATION & APPLICATION

8. LOPA Calculations & SIL Determination

- Calculating risk reduction factors (RRFs)
- Determining Safety Integrity Levels (SILs) for instrumented systems

9. Documentation & Reporting

- Standard formats for LOPA worksheets and reports
- Maintaining traceability and audit readiness

10. LOPA & PHA Integration

- Linking LOPA outcomes with HAZOP and risk registers
- Strengthening decision-making with cross-referenced analysis

ADVANCED CONCEPTS & FACILITATION

11. Advanced LOPA Concepts

- Handling conditional modifiers and complex multi-cause scenarios
- Layer interdependence and credit limitations

12. Facilitating a LOPA Study

- Roles, preparation, and group dynamics
- Skills required for effective facilitation

13. Limitations & Boundaries

- Recognizing when LOPA is not suitable
- Complementary tools (QRA, Bow-Tie Analysis)

14. Practical Applications & Case Studies

- Review of industry examples from chemical and fertilizer sectors
- Hands-on exercise using a sample process scenario

TRAINERS



Mr. Hussain Imam Bukhari
Lead Trainer / Consultant

Hussain Imam Bukhari is a chemical engineer with over 43 years of experience in the petrochemical and fertilizer industries, specializing in project development and management of large-scale fertilizer complexes. He achieved high capacity utilization of 130% and 120% for ammonia and urea plants at FERTIL 1, respectively. Bukhari played a pivotal role in the \$1.3 billion FERTIL 2 project in Ruwais, Abu Dhabi, overseeing feasibility studies, preparation of TOR's, ITB and Technical Bids evaluation for a 2000 MTPD ammonia and 3500 MTPD urea complex operational since 2013. He also led a \$180 million debottlenecking project that increased urea production capacity from 1500 MTPD to 2550 MTPD.

His career includes key roles as General Manager at Fatima Fertilizer Company, as Commissioning Advisor at OQ's Salah Methanol Company and as an External Advisor with McKinsey Pakistan. Bukhari is skilled in strategic planning and negotiation, with experience in preparing reports for corporate boards. He has collaborated with leading organisations like KBR, Haldor Topsoe, Urea CASALE and holds a Chemical Engineering Degree from Punjab University, Lahore (1975). He is affiliated with the Pakistan Engineering Council.



Mr. Asad Aleem Khan
Senior Trainer / Consultant

Mr. Asad Aleem is a seasoned HSE leader with 30 years of service at Engro, spanning Marketing, Logistics, and HSE. He drove safety excellence by leading initiatives that earned the company its first-ever Dupont Rating 4 and won two Marketing Excellence Awards. His landmark achievement—the Defensive Driving & Riding Program—significantly reduced fleet accidents and was later adopted by other organizations. He also developed a community safety awareness program recognized by the company's board. Holding an EMBA from LUMS and an MSc in Physics from the University of Karachi, Mr. Aleem combines technical expertise, regulatory insight, and strong leadership to create safer and more efficient workplaces.

DURATION

2 days

LOCATION

At Client's Site / Lahore

TRAINERS

Mr. Hussain Imam Bukhari | Mr. Asad Aleem Khan

Get in Touch

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