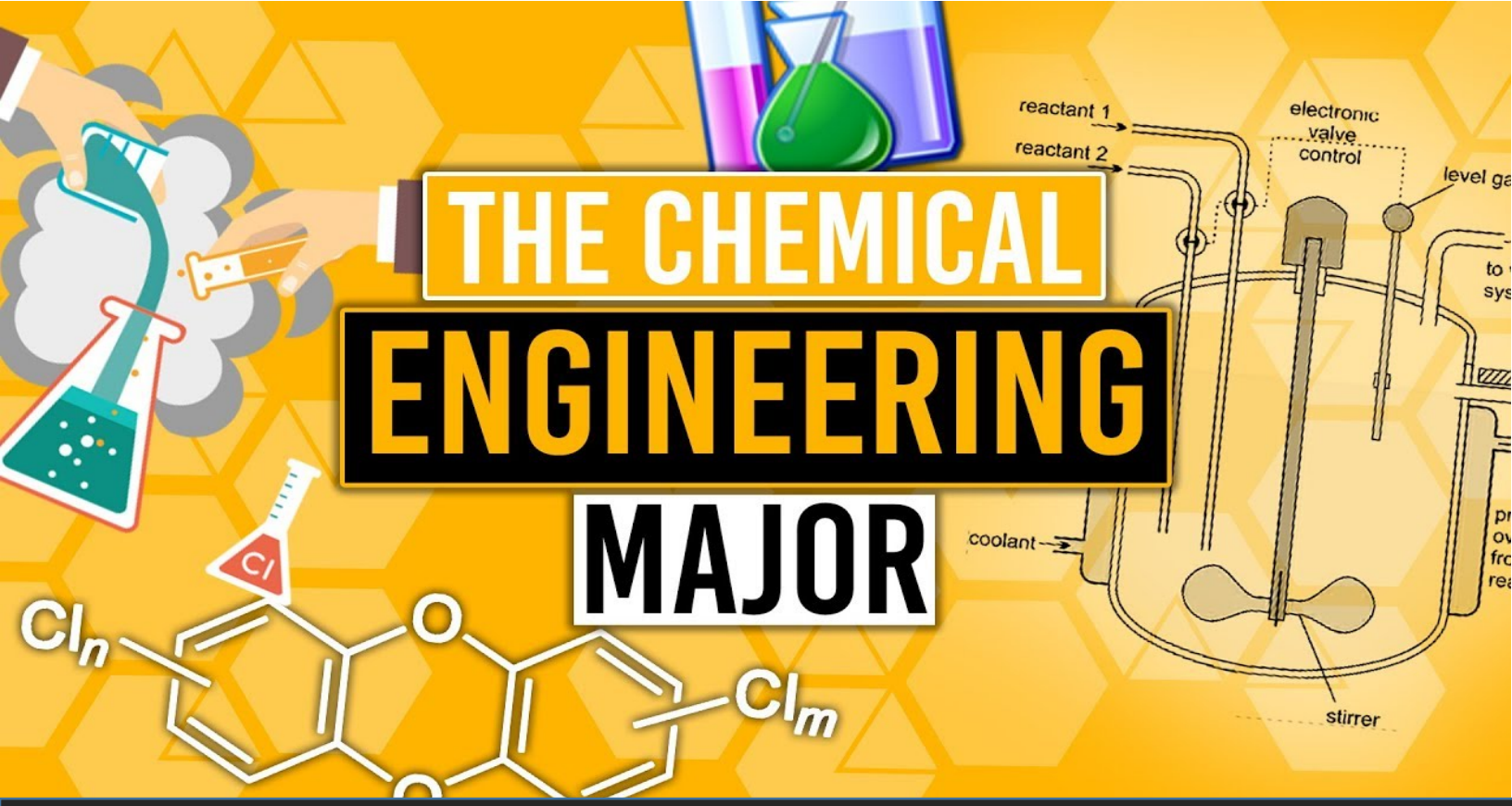

Layout & Design of Process Plant Equipment & Piping Systems

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Layout & Design of Process Plant Equipment & Piping Systems

Introduction:

Designing process plants is a complex and demanding process. The design of plant layout is one of the most important tasks before plant construction. A successful plant layout will not only reduce capitalized cost, but also help to improve the safety of the plant and reduce its environmental impact. Additionally, easy access to individual items of plant equipment is essential for effective operation and maintenance. This course will familiarize participants with all aspects of process plant major equipment and piping systems including the following topics: preliminary sizing and mechanical design of process equipment; equipment configuration; development of plot plans; multi-objectives and optimization of plant layout; layout, design procedures, and practices involved in the location of equipment and layout of associated piping systems; operability, maintainability, safety and environmental implications, and compliance with applicable regulations, codes and standards.

The course will discuss methods for achieving a business-focused facility and minimizing life-cycle costs, highlighting effective interaction between various engineering disciplines (civil, electrical, mechanical, instrumentation, and control). The main aim of this course is to familiarize participants with all aspects of piping systems and the key aspects of the layout and design of process equipment and piping systems.

Who Should Attend?

Engineers and designers involved in plant design activities; project engineers; process engineers, piping fabricators, contractors, and suppliers; piping design and analysis personnel; and, recent engineering graduates in all discipline.

Course Objectives:

By the end of this course delegates will be able to:

- Develop skills in process equipment and piping systems layout design, procedures, and practices
- Determine the impact of layout and pipe routing options
- Achieve business focused facilities
- Comply with regulatory requirements and high plant availability
- Apply design and construction codes and standards for piping and process equipment
- Appreciate the role of stress analysis in avoiding failures
- Avoid catastrophic incidents resulting from poor layout design
- Layout, design procedures and practices involved in the location of equipment and layout of piping systems
- The procedures involved in the layout and piping up of a typical process unit containing pumps, exchangers, horizontal drums, and vertical towers
- The consequence of related disciplines (civil, structural, electrical, instrumentation, etc.) in piping design and layout
- Maintenance and accessibility requirements of piping and related disciplines
- Pipe support requirements & latest CAD Techniques used in piping layout

Course Outline:

Module I: Process Plant Design & Layout Fundamentals

Design and Layout Fundamentals

· Scope and definitions, Design methodologies and guidelines

· Applicable design codes, standards, recommended practices and regulations

Process Plant Design

· Objectives and principles, Methodology and guidelines

· Process flow diagrams (PFDs): symbols, conventions and best practices

Key Considerations Affecting Plant Process Design and Layout

· HSEC (Health, Safety, Environment, Community)

· Safety aspects of plant layout

· Methodology for hazardous area classification

· Plant layout safety index

· Operability and maintainability, Constructability

· Business-focused facilities (BFF): life-cycle cost

Layout Design: General Philosophy and Principles

· Goals of plant layout design, Site location, layout, and conditions, Separation distances

Process Equipment Sizing and Design

· Preliminary sizing and mechanical design of major equipment

· Estimating costs of major equipment and piping

· Standard specifications and data sheets for process equipment

Layout Planning and Procedures

· Plant layout and plot plans: codes of practice relating to plant layout (PIP, NFPA)

· Plot plans, equipment drawings, nozzle specifications

· Piping and instrument diagrams (P&IDs): symbols, conventions, and best practices (PIP)

· Considerations for civil, structural, mechanical, electrical, instrumentation

· Design and layout checklist

Module II: Piping Systems: Design Methodology & Considerations

Piping Fundamentals

- P&ID's, piping arrangements, isometrics, B.O.M.'s, and piping specifications
- Pipe system components; dimensions; pipe data; materials; regulations; codes, standards, and specifications
- Fabrication and installation; piping joints; design bases and documents
- Additional Layout and Design Requirements of Piping Systems
- Basic Design of Piping Systems
- Piping Thermal Expansion and Flexibility
- Pipe Supports and Restraints
- Introduction to Pipe Stress Analysis (ASME B31.3)

Module III: Equipment Piping Layout Considerations & Best Practices

Pressure Vessels and Reactors

Atmospheric Storage Tanks

Fired Heaters & Heat Exchangers & Pumps

Compressors, Blowers, and Fans

Gas Turbines & Steam Turbines