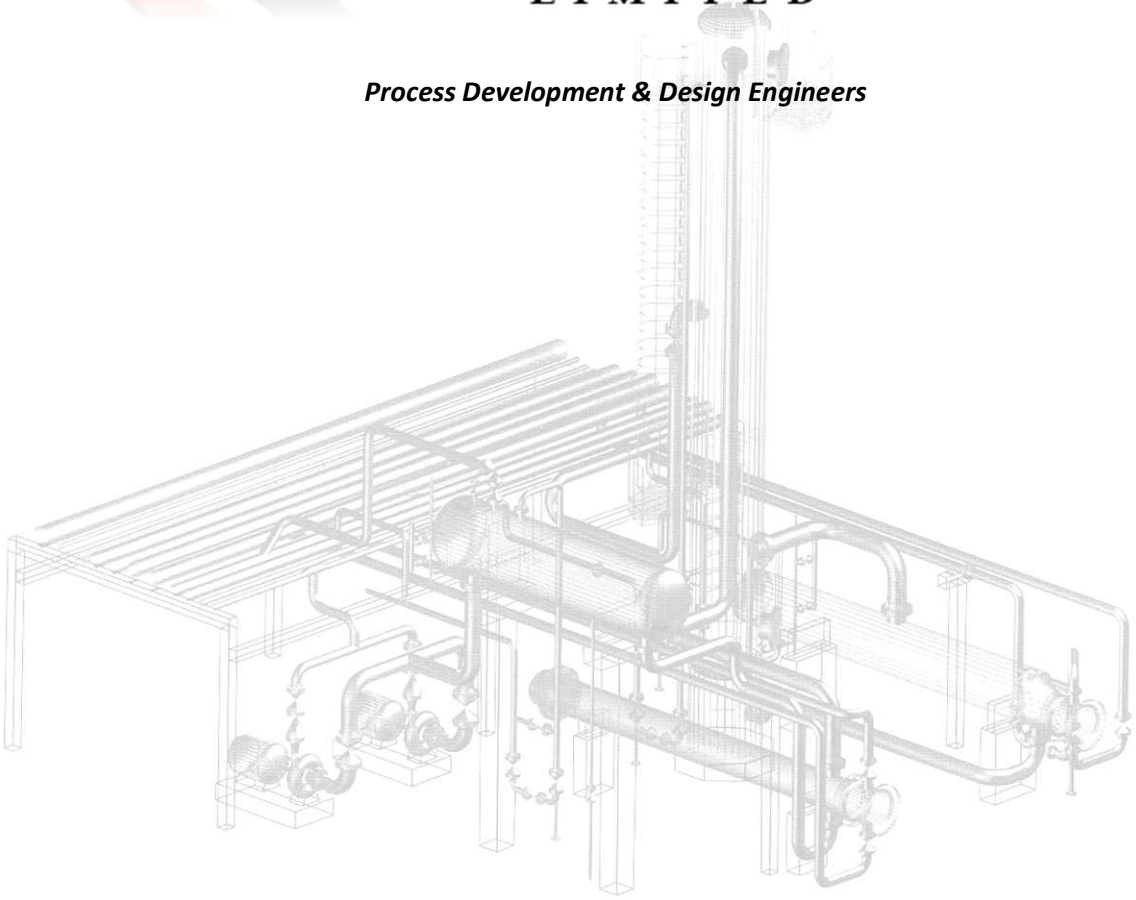
MAINPROPS LIMITED

Process Development & Design Engineers



Training Course Outlines

COMPANY PROFILE

ABOUT US

Mainprops Technology Limited is a Nigerian owned company, established with a vision to offer innovative engineering designs, proactive consultation & training services in Process Engineering, Process Piping Engineering & Design, Process Automation, Instrumentation and Control, Engineering Procurement and Project Management for the Process, Oil & Gas and Petrochemical Industries.

Our services cut across the fields of process and piping design, engineering, procurement, construction, operations and the maintenance of facilities onshore and offshore. We also provide Engineering Training and manpower development in Process Engineering, Piping Engineering, Instrumentation, Automation and Control.

RC No.: **1018175**
TIN: **12728539-0001**

VISION

To become a leading Provider of Piping Engineering Design and consulting services by keeping up with innovations in the progressively evolving Process, Oil & Gas and Petrochemical industries in Nigeria.

MISSION

To provide quality and dynamic engineering services and training to our valued clients. Quality to us means services engineered to meet each customer's peculiar need, performance according to specifications and a timely delivery of goods and services within the project specified budget. And by so doing become a global Engineering service provider in the Process, Oil & Gas and Petrochemical Industries.

To accomplish our mission, we utilize only proven engineering systems and innovative technologies to provide custom made solutions with our focus majorly on the customer's satisfaction.

OUR CORE VALUES

Our Values are **EPIC –** Paying close attention to

Excellence
Progressiveness
Integrity
Customer Satisfaction

STRATEGY

Our business strategy is focused on providing cutting-edge engineering services and client-based solutions. We strategically align with innovative technologies and rely on viable partnerships in order to deliver tailor-made solutions for the peculiar business needs of our valuable customers.

PROCESS PIPING ENGINEERING &DESIGN –ASME B 31.3

Program Description

This program is designed to present all major topics relevant to the Detailed Engineering and Layout Design of Piping Systems, Mechanical, Pressure and Hydraulic Design of Process Piping Systems. And it covers elementary topics in fabrication, installation, integrity assessment and maintenance of piping systems.
The program is full time Instructor based and focused on concept theory, problem solving, system design, drafting and exposure to Industry Leading Software. This is both the Best and most Exclusive Training Program in Nigeria on the subject, that is; comprehensive and suitable for both beginners and intermediate level engineers; believing that professionalism is acquired on the job.

COURSE OUTLINE

*With **FREE** Installation & Training in **PipeData Pro™***

1. **Piping Fundamentals**
   - Introduction to Process Plants
   - Scope of Piping in Projects
   - Plant Piping Systems and Transportation Pipelines
   - Definition & Application of Pipe
   - Pipe Designators – NPS , IPS , NB, Pipe Wall Thickness & Schedule, Pipe
   - Weights, Lengths, Grades, Ends, Joining Methods, Methods of Manufacture, Pipe Ratings, Pipe Symbols.

2. **ASME Codes & Standards**
   - Introduction to ASME Pressure Piping Design Codes.
   - ASME Standards for Common Piping Elements.
   - API Codes
   - Other Codes & Standards

3. **Pipe Fittings – ASME Standards, Selection, Application, Drawing Symbols & Dimensioning.**
   - Types of Fittings – Butt Weld, Screwed & Socket Weld.
   - Elbow – 90 degree (LR & SR), 45 degree, Reducing Elbow
   - Pipe Bends – Miter Bends, 180 degree Return.
   - Branch Connections – Weld Straight & Reducing Tee, Cross & Lateral.
   - Fabricated Branch Connections – Stub In & Stub On, Welding Minimums for Stub In,
   - Branch Reinforcements – Reinforcing Pad, Welding Saddle & Olets
   - O-let Fittings – Weldolets, Sockolets, Threadolets, Latrolets, Elbolets & Sweepolets.
   - Reducers – Concentric & Eccentric, Reducer Offsets.
   - Types of Couplings, Weld Cap.
   - Fitting Makeup – Dimensioning, Minimum Pipe Length Requirements,
   - Placement of Dimensions
   - Screwed & Socket Weld Fittings – Union, Plug, Coupling, Types of Swages.
   - Manufacturing methods of and markings on fittings
   - Dimensioning Exercises

4. **Pipe Flanges – ASME Standards, Symbols, Selection & Application.**
   - Definition of Flange
   - Types of Flanges based on Face and Application, P-T. Ratings – Forged
   - Steel and Cast Iron Flanges.
   - Flange Facings – Flat Face, Raised Face, RTJ, & Male - Female, Tongue &
   - Groove, Flange Face Finish
   - Weld Neck, Slip On, Threaded, Socket Weld, Lap-Joint, Reducing, Blind &
   - Orifice Flanges.

   - Gaskets – Types, Thickness, Bolts & Nuts

- Dimensioning Exercises

5. **Valves – ASME/API Standards, Symbols, Selection & Application**
   - Definition.
   - Valve Functions, Locations & End Connections.
   - Valve Types – Gate, Globe, Ball, Check, Butterfly, Angle, PRV/PSV, & Plugs etc.
   - Control Valve Manifold. – Layout Representation & Requirements.
   - Valve Operators.
   - Valve Layout Considerations
   - Valve Data Sheets
   - Valve Selection
   - Dimensioning Exercises

6. **Piping Special Elements**
   - Strainers
   - Bellows/Expansion Joints
   - Rupture Disc
   - Spectacle Blind
   - Blanks
   - Spacers
   - Spray Nozzles
   - Steam Traps
   - Flame Arrestor
   - Vortex Breaker

7. **Mechanical Equipment - API Standards, Symbols, & Application.**
   - Static – Horizontal Vessels, Vertical Vessels, Storage Tanks, Heat Exchanger & Reboiler
   - Rotary – Pumps, Compressor, Fans, & Steam Turbines.

8. **Flow Diagrams**
   - Process Flow Diagram – PFD
   - Piping & Instrumentation Diagram – P & ID.
     1) Line Numbering
     2) P& ID Requirements
     3) Print Reading Exercise
     4) Line Number
     5) Flow Diagram Vs Piping Drawings.
     6) Flow Diagram Exercises.
     7) Symbols & Abbreviations.
   - Instrument Types & Symbols – Flow, Temp, and Pressure & Level
   - Utility Flow Diagram – UFD

9. **Piping Specifications**
   - Piping Specifications
   - Material Selection
   - P-T ratings
   - Valve Data Sheets

10. **Plot Plan, Equipment Layout, & Piping GA Drawings.**
    - Plot Plan Development & Requirements.
    - Equipment Layout Terminology, Control Point & Battery Limits.
    - Preparation of Equipment Layout
    - Piping GA Drawing Requirements and Layout Procedure
    - Pump GA Drawing and Layout Consideration
    - Tank & Vessel Layout Consideration
    - GA - Print Reading Exercise

11. **Piping Isometrics**
    - Definition
    - Drawing Piping Isometrics
    - Isometric Dimensions, Notes & Callouts
    - Isometric Offsets.
    - Print Reading Exercises.
    - Exercises on Creation of Isometrics from Piping Plans and Section drawings

12. **Piping Spools**
    - Definition
    - Types of Spool Drawings.
    - Guidelines to Prepare Spool Drawings
    - Print Reading Exercises
    - Exercises on Creation of Piping Spool from Piping Isometrics
    - Preparation of BOQ /MTO

13. **Pipe Supports**
    - Classification of Supports
    - Primary & Secondary
    - Anchors

- Pipe Guides
- Limit Stops
- Pipe Shoe
- Dummy Leg / Trunion
- Field Support / Base Support
- Rigid Hangers – Rod & Clevis, Trapeze
- Flexible Hangers – Variable & Constant
- Pipe Rack Design – Types, Height & Width Calculations, Pipe Arrangements
- Control Station & Utility Station on Pipe Racks

Numerous Exercises are carried out to illustrate application to Piping Systems, Detailed Engineering, Layout Engineering and Pipe Drafting

Piping Systems Design

1. Hydraulic Design of Liquid Piping Systems & Pipelines

- Pipe Sizing calculations
- Velocity Variation in Pipes
- Typical Velocities for Water Piping & Other Liquids
- Pressure Drop due to Friction
- Hazen Williams Equation and Darcy Weisbach Equation
- Friction Factor, Reynolds Number, Colebrook White Equation and Moody Diagram
- Minor Losses in Pipe Fittings – Equivalent Length Method & K Factor method.
- Total Pressure Required – Friction Head, Elevation Head, Minimum Delivery Pressure
- Elements of Total Dynamic Head – Static Head, Pressure Head, Velocity Head, Friction Head
- Pump Horse Power Required.
- Cavitation in Pumps
- NPSH Required & NPSH Available for Pumps.

Numerous Examples are covered to illustrate application of Pipe Hydraulics

2. Pressure Design of Process Piping Systems – ASME B 31.3

- Scope of ASME B 31.3,
- ASME B 31.3 Fluid Service Categories
- Design Pressure & Design Temperature for Piping Systems
- P-T Ratings of Flanges, Butt-weld Fittings & Socket Weld Fittings
- Pressure Design of Straight Pipe under Internal Pressure – Wall thickness Calculations
- MDP – Maximum Design Pressure for Piping Systems
- Branch Reinforcements – Reinforcement Pad Calculations
- Pipeline Wall thickness Calculations – B 31.4 / B 31.8
- MAOP – Maximum Allowable Operating Pressure for Pipelines.
- Piping Material Selection per ASME Code.

ADDITIONAL TOPICS:

Piping System Fabrication, Maintenance & Integrity Assessment Procedures

Note: These are elementary / introductory topics for beginners on the subjects

1. Fabrication Procedures
   - Pipe preparation for welding
   - Pipe Fitting and Welding procedures
   - Pipe Spooling
   - Fabrication and Installation

2. Hot Tapping & Line Stopping
   - What is Hot Tapping & Why Hot Tapping?
   - Hot Tapping Set Up, Operations & Procedure
   - Line Stopping Procedure

3. Pipeline Pigging Operations
   - Definition and uses of Pigs
   - Types of Pigs
   - Pigging operation's procedure

Who Should Attend

- Mechanical, Chemical, Petroleum and Material Engineers
- Technicians, Fitters and Welders
- Draftsmen

What You Will Learn

How to perform Detailed Engineering, Design, Drafting and layout design of Chemical plant, Petroleum refinery, Gas Processing plant, Petrochemical, Pharmaceutical, Textile, Paper, Semiconductor & Cryogenic Plants in line with the requirements of ASME B 31.3

Materials- *(Your Take Home)*

Training Manuals, Software, Piping Engineering &Design eBooks, Design Charts & Tables and we Guarantee Knowledge transfer.

What You Should Bring

Participants should bring a Laptop computer (if you have one), a scientific calculator, sketchpad, pen and a notebook.

Duration: Required minimum duration – **5 days Full-time.**

Course Fee: Contact us for an invoice

Training Features

- Instructor lead hands-on training
- Assessment quiz and certificate at completion.
- Conducive training environment
- Excellent Material Provided
- Industry Leading Software used in Training
- Individual Attention & Placement Guidance

We look forward to welcoming you on one of our training sessions….