

VIRTUAL PIPELINE

training series

design and theory

for natural gas pipeline engineers

Learn the fundamentals of pipeline design through interactive tutorials. The design and theory CD moves step by step through a natural gas transmission design. The tutorials cover the theory of pipeline design as it relates to a practical design problem.

Voice narrative and vivid graphics work together to create an effective learning experience.

The **design and theory** CD provides your engineers a link between basic theory and current industry pipeline modeling techniques. Use it as a tool to train new engineers or as a reference for experienced design engineers.

Workbook

The accompanying workbook gives detailed instructions for completing each stage of the design using any spreadsheet program as a method of calculation. At the end of the training, you will have all the tools necessary to complete a basic pipeline simulation.

Exam

You can test your skills at the end of the training by completing an optional exam. In this exam, you apply the concepts and worksheet calculations to a new design problem. If you are successful, you can print out a certificate of completion.

Using Spreadsheets to Model

The spreadsheet calculations build in complexity until you create a basic pipeline simulation model. The final model takes into account elevation changes, horsepower and fuel usage for up to four compressor stations on a two hundred mile pipeline.

Pricing Information:

Virtual Pipeline -
Design and Theory
(1 CD+3 Workbooks): \$5,000 U.S.*

*All prices are subject to change.



Tutorial Topics

As you design the pipeline, the tutorials guide you through the following topics:

Natural Gas Composition

- Units
- Specific Gravity
- Density
- Molecular Weight
- Ratio of Specific Heats
- Z-factors
- Viscosity
- Energy Content

Natural Gas Pipeline Flow

- Friction Losses
- Pipe Internal Diameter
- Friction Factor Calculation
- Flow Equations
- Calculating Maximum flow rate
- Adding Compression

Compression of Natural Gas

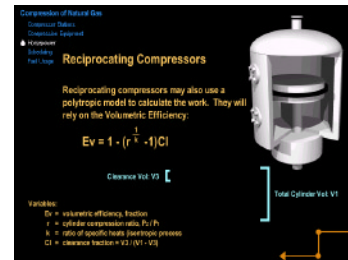
- Compressor station design
- Compression Equipment
- Reciprocating Compressors
- Centrifugal Compressors
- Compressor models
- Horsepower calculations
- Scheduling
- Fuel Usage

Pipeline Economics

- Project Estimation
- Accounting
- Present Worth Analysis
- Cost Throughput Curves

Reference

- Title 49 Part 192 document
- Flow Equations:
 - Weymouth
 - Panhandle A
 - Panhandle B
 - Classic Flow
- Compressor Models:
 - Isentropic
 - Polytropic
 - Isothermal
- Thermodynamic Properties Table
- Molecular Weights
- Critical Temperatures
- Critical Pressures
- Z-factors
- Specific Volumes
- High Heat Values
- Low Heat Values
- Economic Equations



Design Resources and References

The design and theory CD provides valuable design resources: Compressor Models, Flow Formulas, Thermodynamic Properties, Economic Equations and the Title 49 part 192 Code of Federal Regulations. The tutorials incorporate the design resources into the problem solution, providing you with not only the information, but the context for its use.

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