

일반 가스 취급자를 위한 설계 및 조작의 공학 기본 원리

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Fundamental engineering points for gas-related plant designers and operators

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Fundamental concepts

Conservation of mass

Conservation of energy (1st law of thermodynamics)

Conservation of momentum (Newton's second law of motion)

Second law of thermodynamics (Entropy balance)

Fluid Flow

Fluid flows high $P \rightarrow$ low P (ΔP)

Material balance

Energy balance

Momentum balance

Rate equation

Reynolds number :

Laminar flow range

Turbulent flow range

Piping design

Compressor design

Pump design

Measurement

Relief systems

Two major factors in designing fluid system

Friction drop

Difference in head

Gases

Pressure variable

Density variable
Compressible flow :
Velocity → Velocity of Sound
Choke flow
Water hammer

Heat transfer

Differential in temperature (ΔT)
Heat flow high T → low T
Mass balance
Energy balance
Rate equation
How heat moves :
Radiation
Conduction
Convection
Heat exchanger (Shell and Tube) :
Scaling
Fouling
Cooling towers

Mass transfer

Mass moves due to concentration difference (ΔC)
Mass balance
Energy balance
Rate balance
Stages
Packing
Design of tower :
Diameter of tower
Height of tower
Separators and filters
Fractionation and absorption

Thermodynamics

Properties
K data
Refrigeration