FACULTY OF ENGINEERING
DEPARTMENT OF CHEMICAL ENGINEERING

INTRODUCTION TO CHEMICAL ENGINEERING
CEN 101

Assoc.Prof.Dr. Hakan KAYI

UNIT SYSTEMS

- System International (SI)

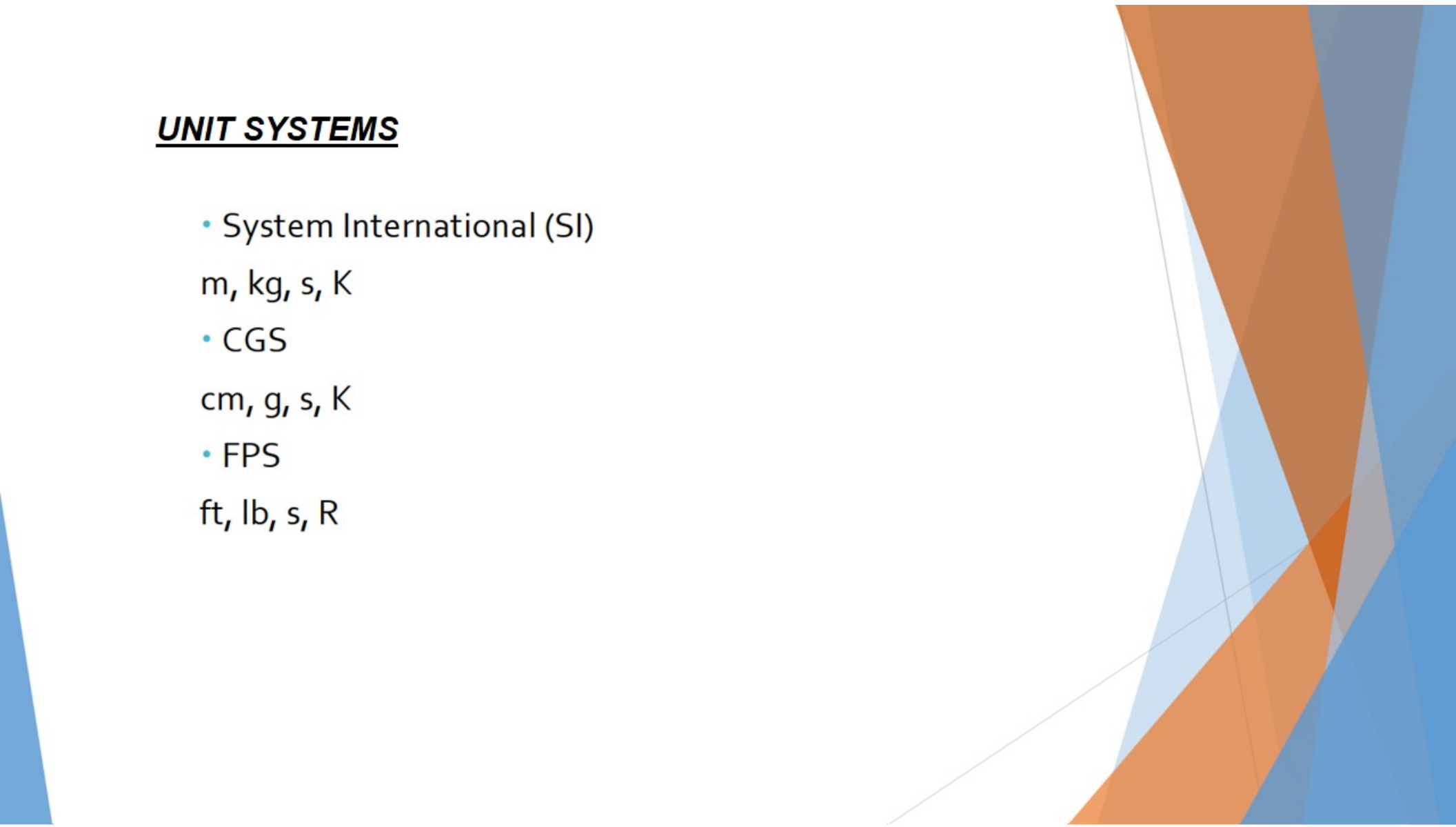
m, kg, s, K

- CGS

cm, g, s, K

- FPS

ft, lb, s, R



METRIC PREFIXES

Prefix	Symbol	Multiplier	
exa	E	10^{18}	1,000,000,000,000,000,000
peta	P	10^{15}	1,000,000,000,000,000
tera	T	10^{12}	1,000,000,000,000
giga	G	10^{9}	1,000,000,000
mega	M	10^{6}	1,000,000
kilo	k	10^{3}	1,000
hecto	h	10^{2}	100
deka	da	10^{1}	10
deci	d	10^{-1}	0.1
centi	c	10^{-2}	0.01
milli	m	10^{-3}	0.001
micro	μ	10^{-6}	0.000,001
nano	n	10^{-9}	0.000,000,001
pico	p	10^{-12}	0.000,000,000,001
femto	f	10^{-15}	0.000,000,000,000,001
atto	a	10^{-18}	0.000,000,000,000,000,001

SOME DEFINITIONS USED IN ENGINEERING CHEMICAL CALCULATIONS

Density: mass per unit volume of a substance, $\rho = m/V$ (kg/m^3, g/cm^3, lbm/ft^3)

Specific volume: volume occupied by a unit mass of the substance (m^3/kg, cm^3/g, ft^3/lbm).

Specific gravity: $SG = \rho/\rho_{ref}$ ($\rho_{ref} = \rho_{H2O}$ @ 4°C , 1.000 g/cm^3, 1000 kg/m^3, 62.43 lbm/ft^3)

PROCESS VARIABLES

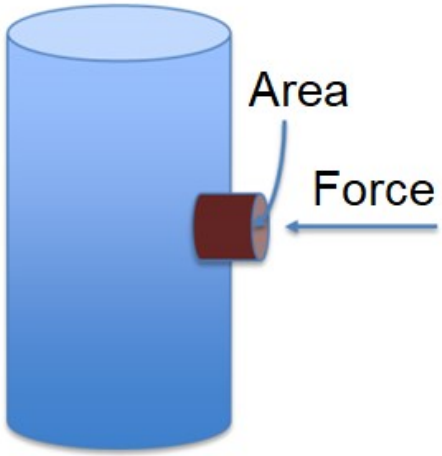
Design
Operation

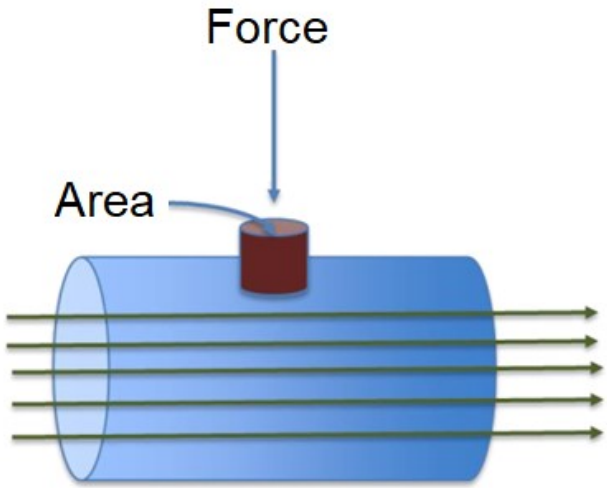
Material amounts, compositions, conditions

Variables used to characterize a process:
Mass, volume, flow rate, chemical composition, concentration, pressure and temperature

PRESSURE = Force / Area

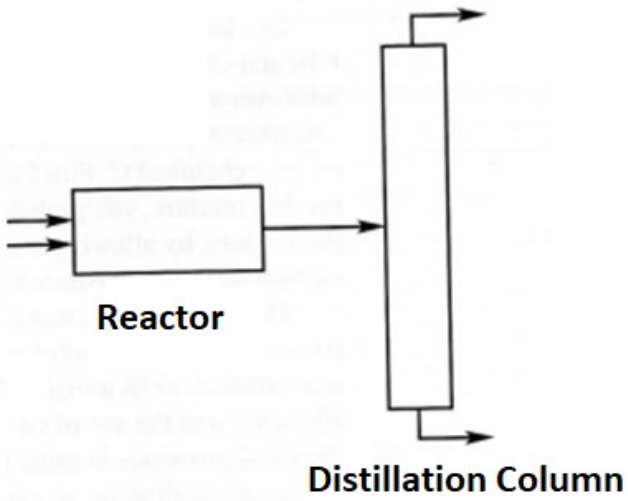
(N/m^2, $dynes/cm^2$).





FLOW RATE

Most processes involve the movement of a material from one point to another, sometime between process units, sometimes between a production facility and depot.



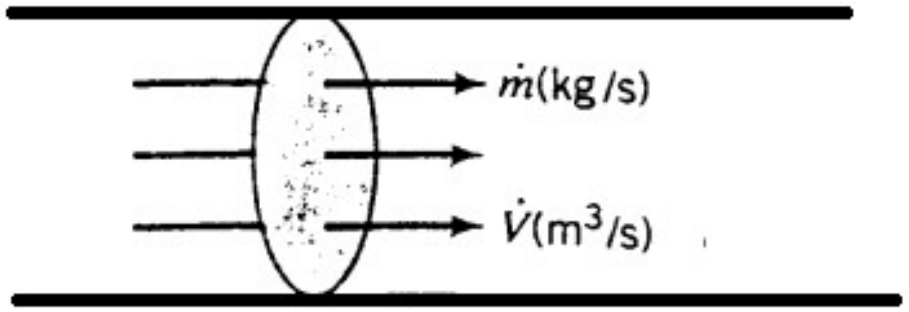
The rate at which a material is transported through a process line is called **flow rate** of that material.

FLOW RATE

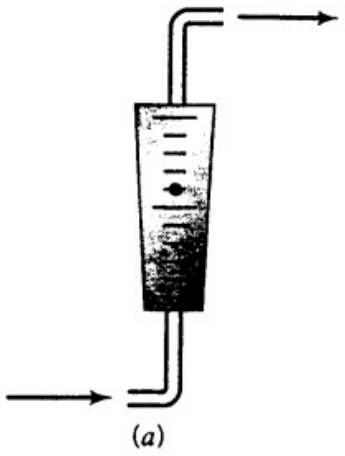
Mass flow rate
mass/time

Molar flow rate
mol/time

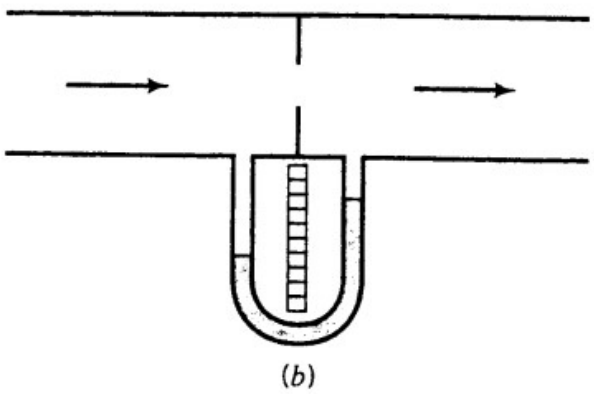
Volumetric flow rate
volume/time



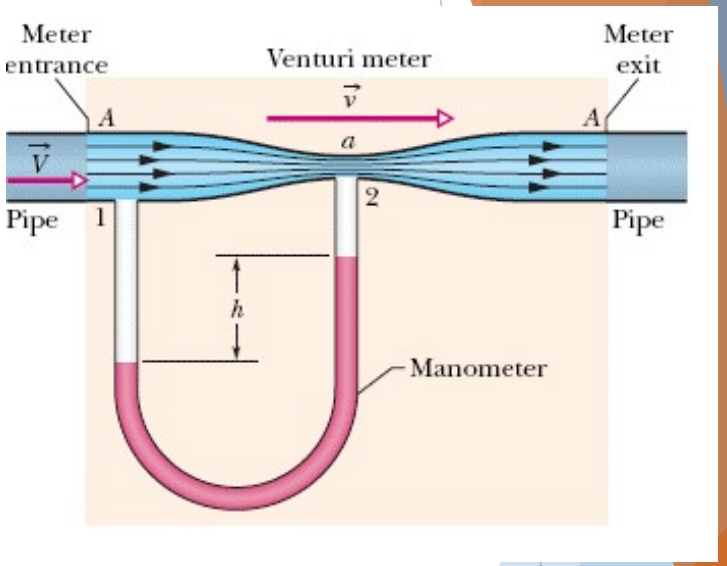
FLOW RATE MEASUREMENTS



rotameter



orifice meter



Venturimeter

Fluid mechanics !!!