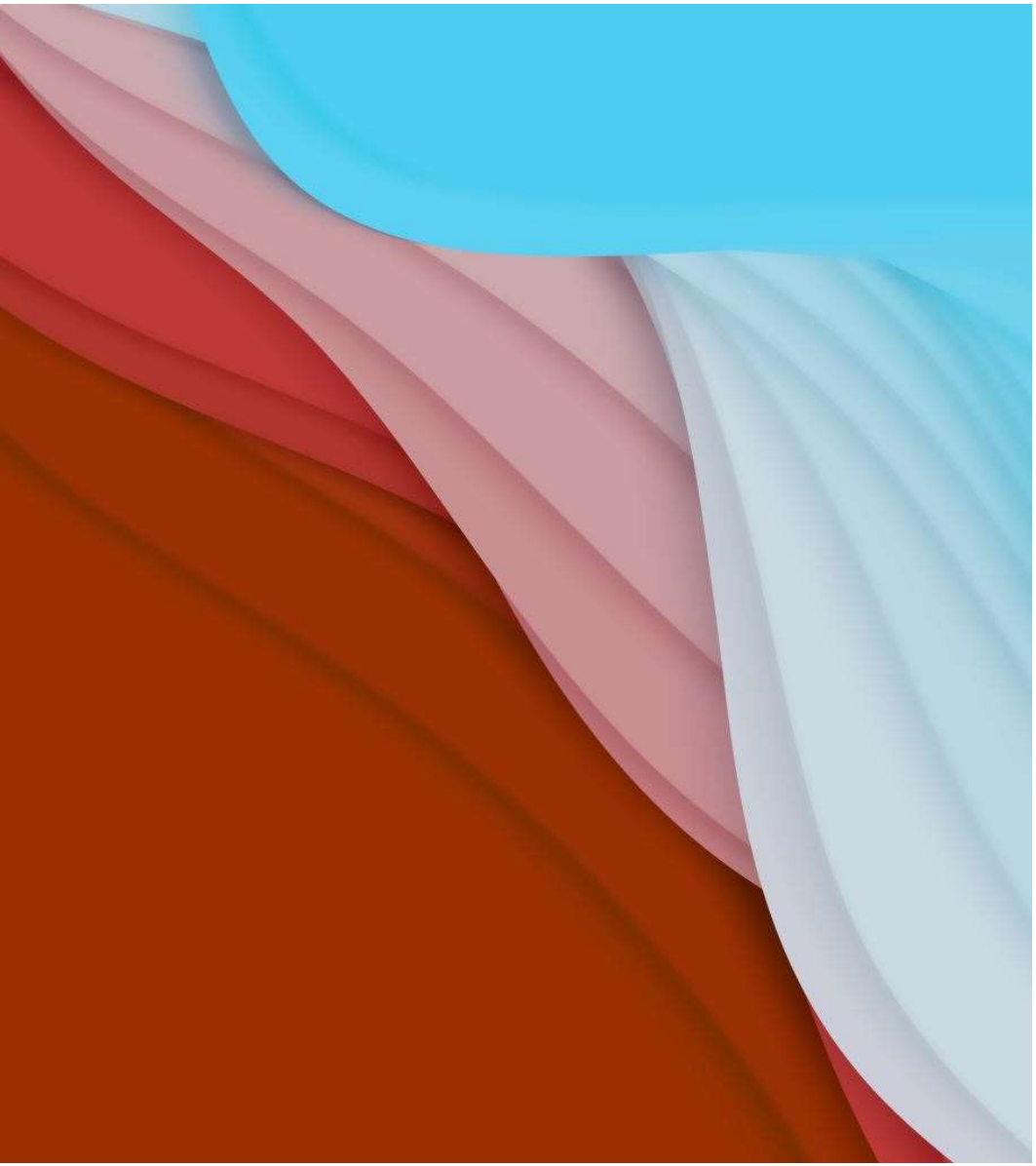


CEN4415
PROCESS DESIGN I

COMPUTER-AIDED FLOW-SHEETING

Process Simulation Programs

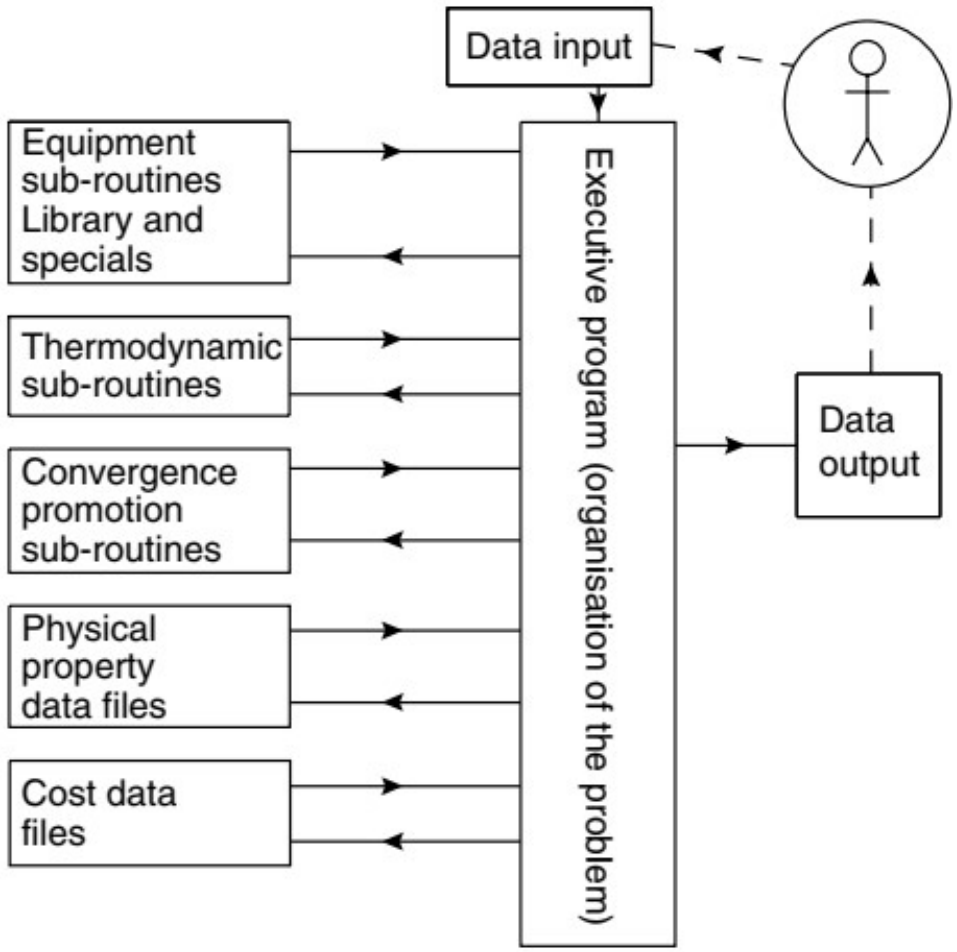
1. *Simultaneous, Equation based*

- Entire process is described by a set of differential equations, and the equations solved ***simultaneously***.

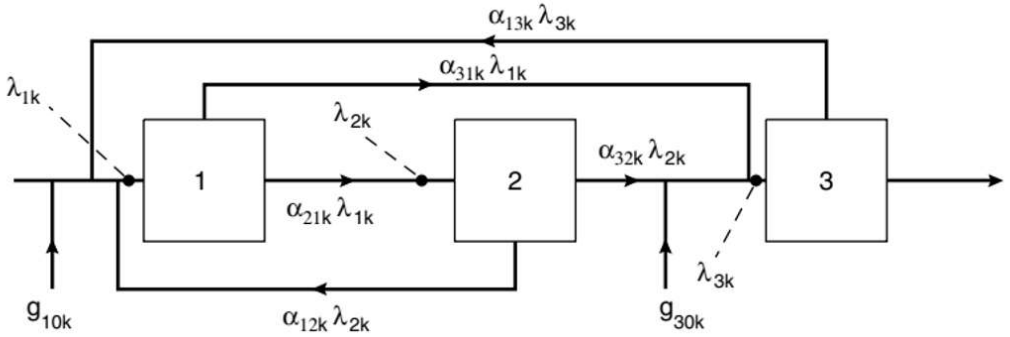
2. *Sequential-modular*

- Equations describing each process unit (module) are solved module-by-module in a ***stepwise*** manner.

Structure of a Process Simulation Program



MANUAL CALCULATIONS



$$\lambda_{1k} = g_{10k} + \alpha_{12k}\lambda_{2k} + \alpha_{13k}\lambda_{3k}$$

$$\lambda_{2k} = \alpha_{21k}\lambda_{1k}$$

$$\lambda_{3k} = g_{30k} + \alpha_{32k}\lambda_{2k} + \alpha_{31k}\lambda_{1k}$$

PIPING & INSTRUMENTATION DIAGRAMS (P&IDs)

- It is a description of the nature of the process.

- The *Piping and Instrument diagram (P&ID)* shows the engineering details of the equipment, instruments, piping, valves and fittings; and their arrangement.

- It is often called the *Engineering Flow-Sheet*, *Engineering Line Diagram* or *Mechanical Flow Diagram (MFD)*.

Information found on a P&ID

Equipment
Backup units
Parallel units

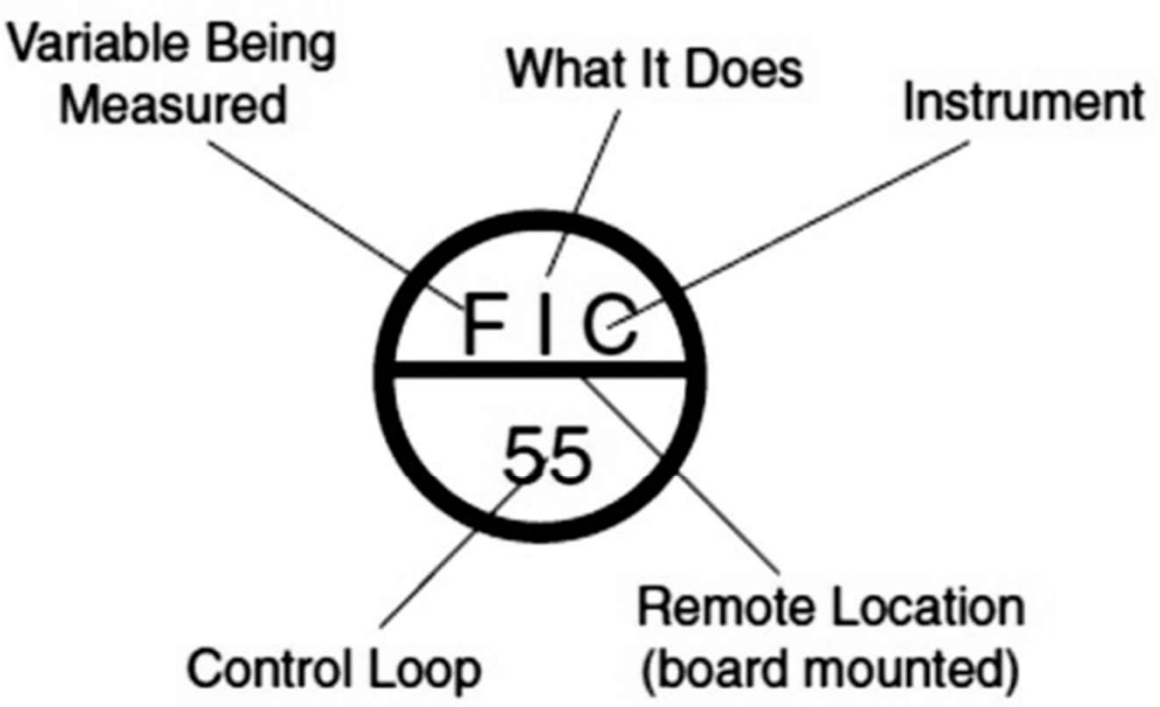
Piping
Size (Use Standard Sizes)
Schedule (Thickness)
Materials of construction

Instruments
Indicators
Controllers

Utilities
Entrance utilities
Exit utilities

Exclusions from P&IDs

1. Operating conditions T,P
2. Stream flows
3. Equipment locations
4. Pipe routing
   a. Pipe lengths
   b. Pipe fittings
5. Supports, structures, and foundations


Variable Being Measured
What It Does
Instrument
F I C
55
Control Loop
Remote Location (board mounted)

REFERENCES

1. Sinnot, R.K. 1999, Coulson's & Richardson's Chemical Engineering, Volume 6, Chemical Engineering Design, ButterWorth Heinemann, Oxford.

2. Turton R., Bailie R.C., Whitin W.C., Shaeiwitz J.A. 1998, Analysis, Synthesis and Design of Chemical Processes, Prentice Hall, New Jersey.