화학공정설계에서의 Simulation의 응용

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Process Flowsheeting

the use of computer aids to perform steady-state heat and mass balancing, sizing, and costing calculations for a chemical process

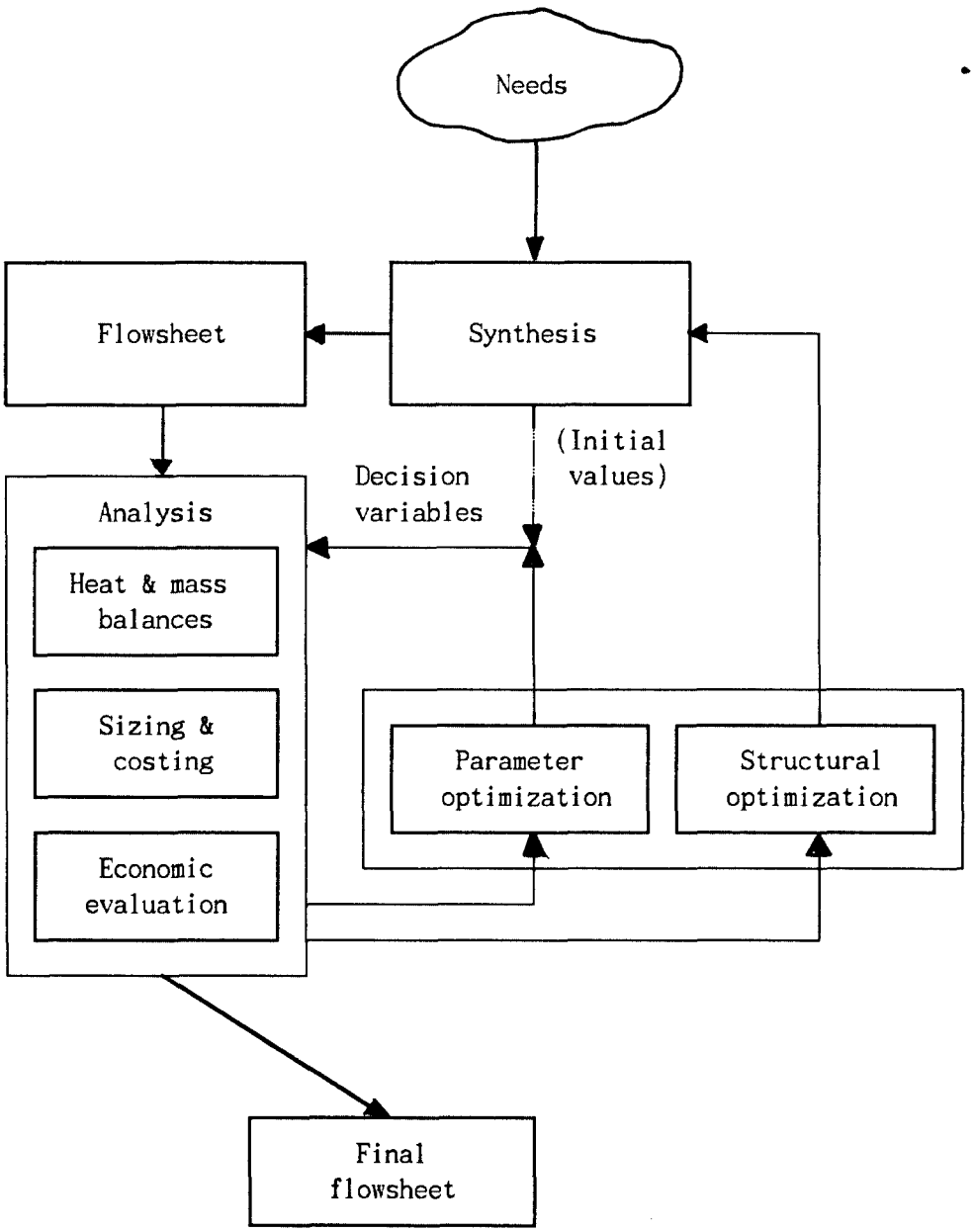
Process Design

1. **Synthesis**
   - developing a flowsheet structure

2. **Analysis**
   - solving heat and mass balance
   - sizing and costing equipments
   - evaluating the worth of flowsheet

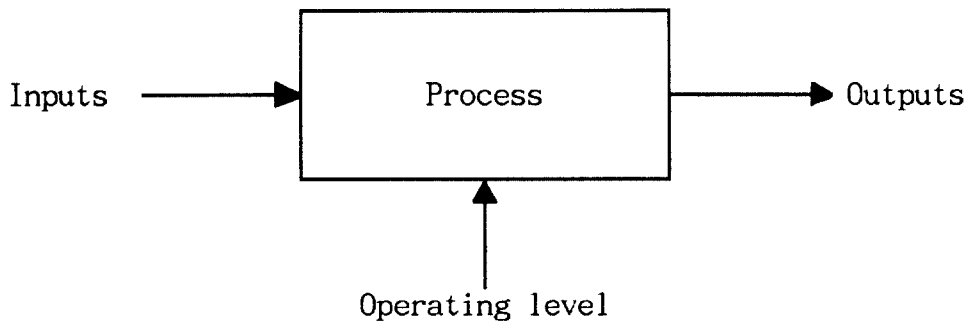
3. **Optimization**
   - parameter optimization
   - structural optimization

Process Design

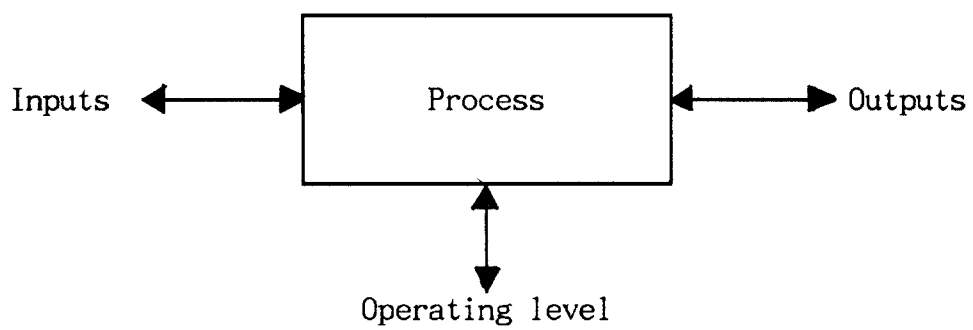


Design Calculations

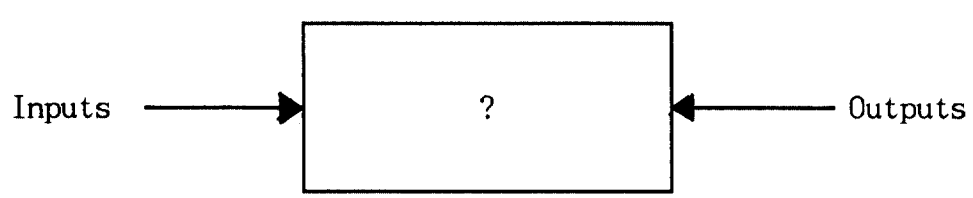
1. Simulation



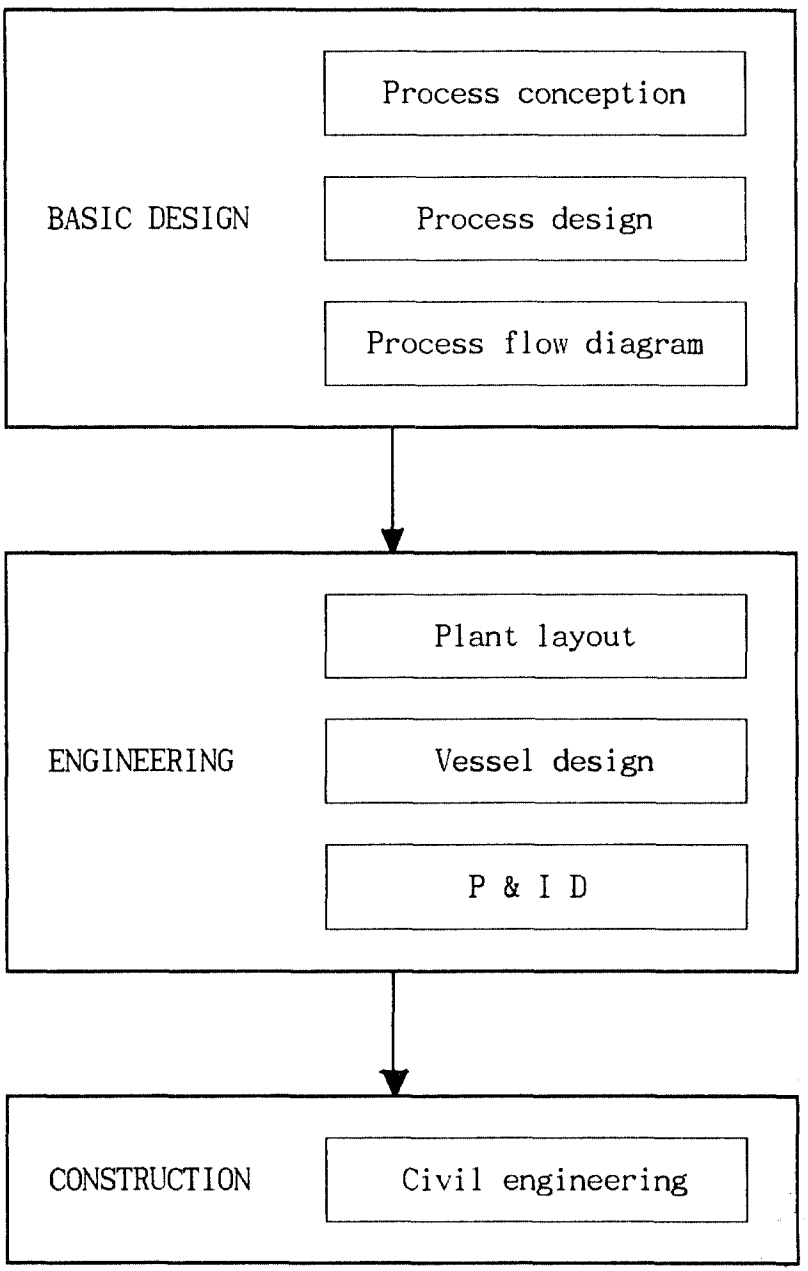
2. Analysis



3. Synthesis



The Total Plant Design Project



Advantages for Flowsheeting System

. aid in flowsheet and data input
. consistent solution for repeated calculations

Disadvantages

. no answer for an ill-suited or
an ill-defined system

Human's Role in Flowsheeting

Flowsheeting systems are man-made
and as such contain 'bugs'
which the user may be unaware of,
or all-too-aware of.
And, these 'bugs' may lead to
incorrect answers or no answers.

History of Process Flowsheeting

- 1955 ~ 1959 :

. premitive computer technology
. no language such as FORTRAN
. design calculations only for single units
. Kelloggs - Flexible Flowsheet Program

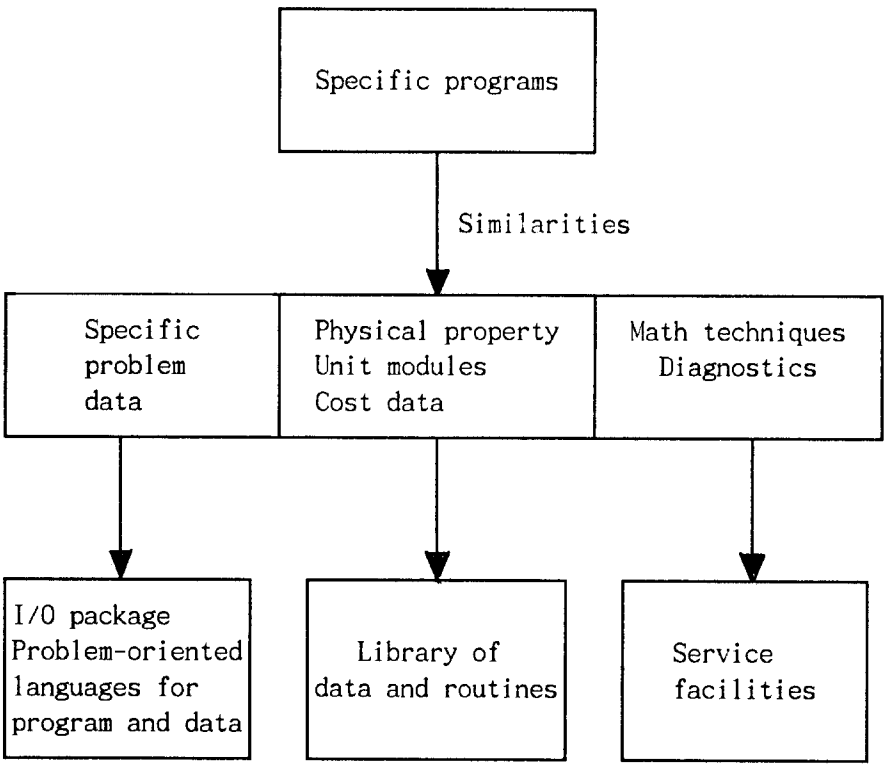
- 1960 ~ 1964

. several simulators
. high level language ~ FORTRAN
. modular fashion
. rigorous physical property calculations

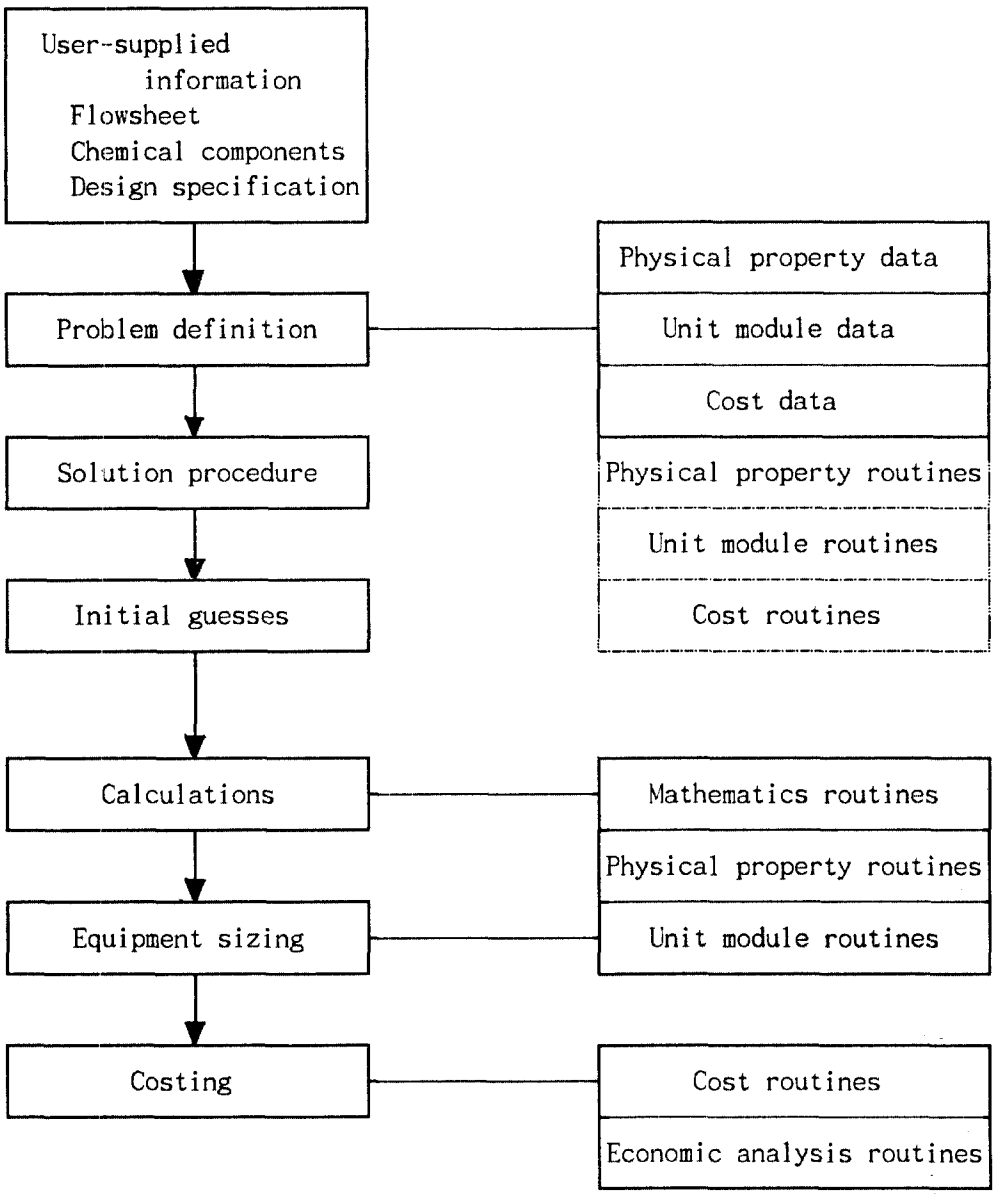
- 1965 ~ 1969

. proving and weeding-out time
. large scale computer power available
. prove flowsheeting programs useful
. fast, reliable enough to be practical
for even moderately large process
. special purpose program

Motivation for Development of General Purpose Flowsheeting Programs



Developing a Simulation Model



Simulation Methods

1. Sequential modular approach

. calculate the output stream values of a unit given its input stream values and the unit parameter values

. rigid structure, straight solution algorithm
. no good for general design specifications

2. Equation-oriented approach

. flowsheet = a collection of simultaneous nonlinear equations

. gather full set of equations and solve it

. flexible structure
. complex solution algorithm
. good for any kind of design calculations

Commercially Available Simulators

1. ASPEN PLUS

. Sequential modular approach
. steady-state simulation only
. one of the most popular packages in process flowsheeting

2. SpeedUp

. Equation-oriented approach
. steady-state and dynamic simulation
. unique dynamic simulator commercially available