1

Simulation:

Key words : Executive Program, unit computation and Information flow Diagram.

The Executive Program

This transmits information through streams and store the calculated results. It can plan the sequence in which calculation are to be done.

Several UWOPs, CHIPS, PACWR, CHEVRON, POWER FACTS etc.

Unit Computations

A set of calculations that predicts what occurs within an equipment unit is called Unit computation.

A heat exchanger has the following Unit computations

$$q = UA\ (\Delta T_{min)} \tag{1.1}$$

$$\frac{1}{U} = \left(\frac{1}{h_i} + \frac{1}{h_{id}}\right)\cdot\frac{d_o}{d_i} + \frac{d_o l_n\left(d_o / d_i\right)}{2k_w} + \frac{1}{h_o} + \frac{1}{h_{od}} \tag{1.2}$$

How to create a Simulation:

To create a simulation the engineer writes Unit computations. Following figure shows a strategy for solving the problem.
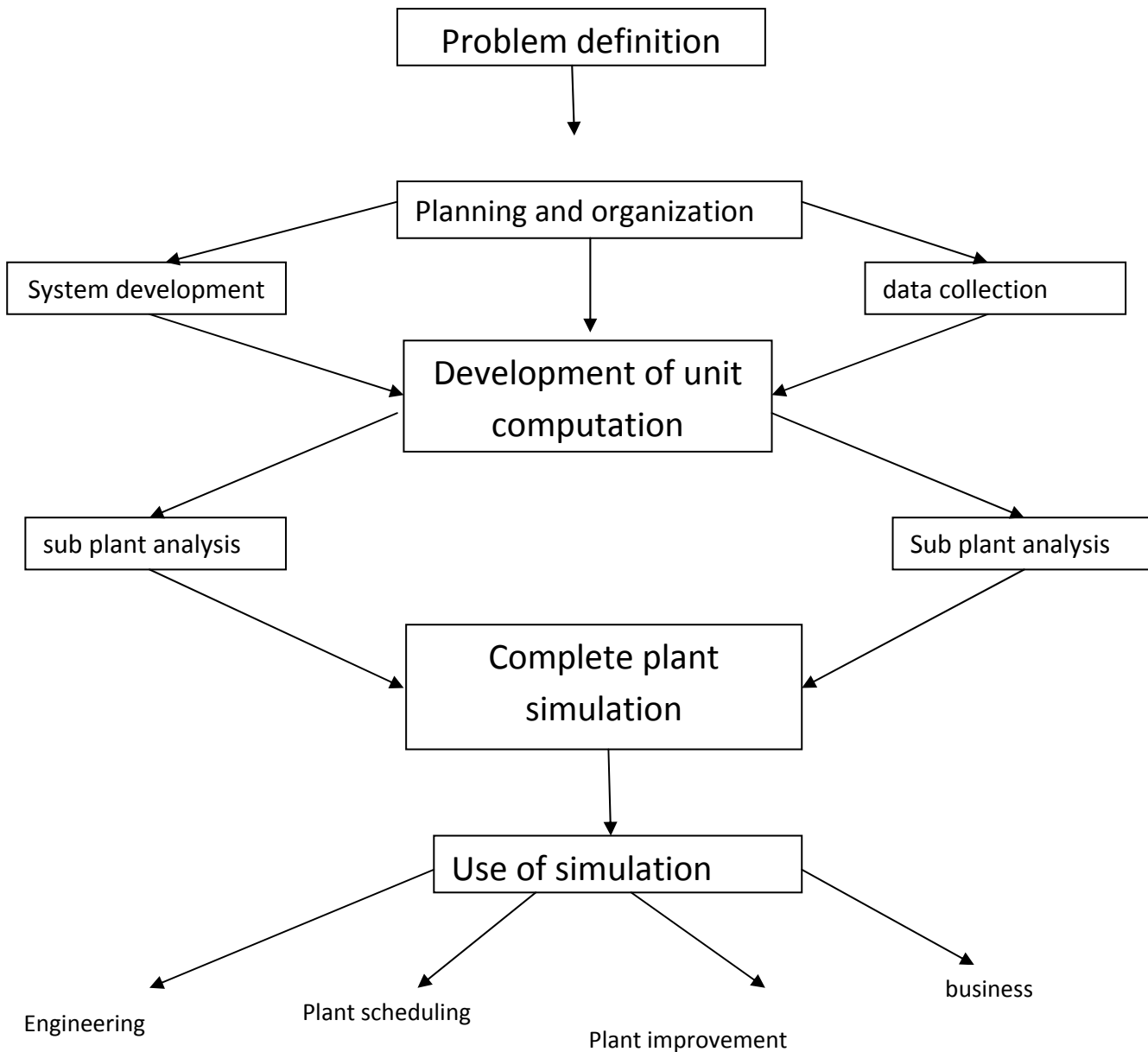
Fig. 1.1 Creation of Simulation of a Plant.

Process simulation requires the following skills:

- o A sound understanding of engineering fundamentals
- o modeling skills
- o computational skills

Chemical process simulation:

- o Steady state simulation
- o Dynamic simulation

General strategy of process simulation of complex process follows a fairly well defined path consisting of the common sense steps given in the figure 1.2.
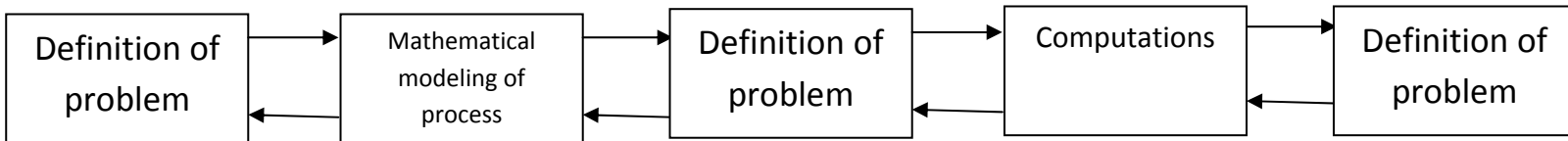
| Definition of problem | → ← | Mathematical modeling of process | → ← | Definition of problem | → ← | Computations | → ← | Definition of problem |

Fig. 1.2 Common steps of process simulation

Limitations of process simulation

- o Lack of good data and knowledge of process mechanism.
- o Character of the computational tools
- o the danger of forgetting the assumptions mode in modeling the process

Development a description of Information flow.

Information is a set of values for the variables of a process needed to describe fully state of a stream at any point in the process. These include flow rate temperature, pressure and composition of a process fluid. Information can flow from place to place not only through actual streams but also through control lines across heat exchanger surfaces. A process flow diagram of a typical plant is given in figure 1.3.
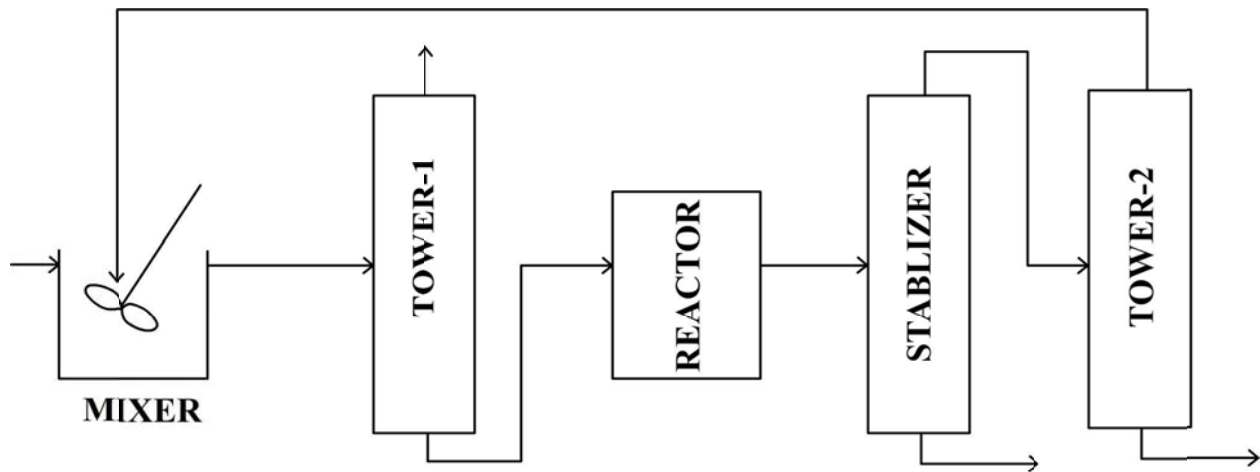
Fig. 1.3 Process Flow Diagram of a Typical Plant

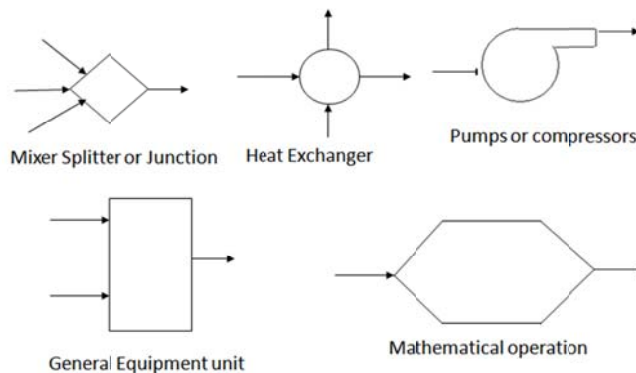A set of distinctive symbols will be adopted for the various type of unit computation. These are given in figure 1.4.

Figure 1.4 : Unit Computation

Modularity:

It means that each unit computation must be written so that the calculation is independent of the source of the input information and the use of output information.

A given unit computation may be used for several different equipment units of the same basic type in the same processing scheme.

From process to Information flow diagram

A process flow diagram depicts the equipment and pipes which make up the plant. The pipes are shown as arrows pointing in the direction of material flow. Such a diagram can be encoded in numerical form for use in computer. This is done in two steps

- Conversion of process flow diagram into information flow diagram.
- Conversion of information flow diagram in to numerical form.

Conversion of process flow diagram into information diagram

The information flow diagram represents the flow of information via streams between unit computations. It is constructed as follows:

(a) Each unit computation is represented by a suitable symbol.
(b) Each symbol is given the name of a unit computation
(c) The flows of information between units are drawn as directed lines (streams) between symbols, with arrows indicating the direction of information flow.
(d) The steams and symbols are separately numbered, usually ascending in the direction of flow. The numbering is arbitrary, but no two symbols or two streams may have the same numbers.

By following the above procedure, the figure 1.3 is converted into information flow diagram as shown in figure 1.5.
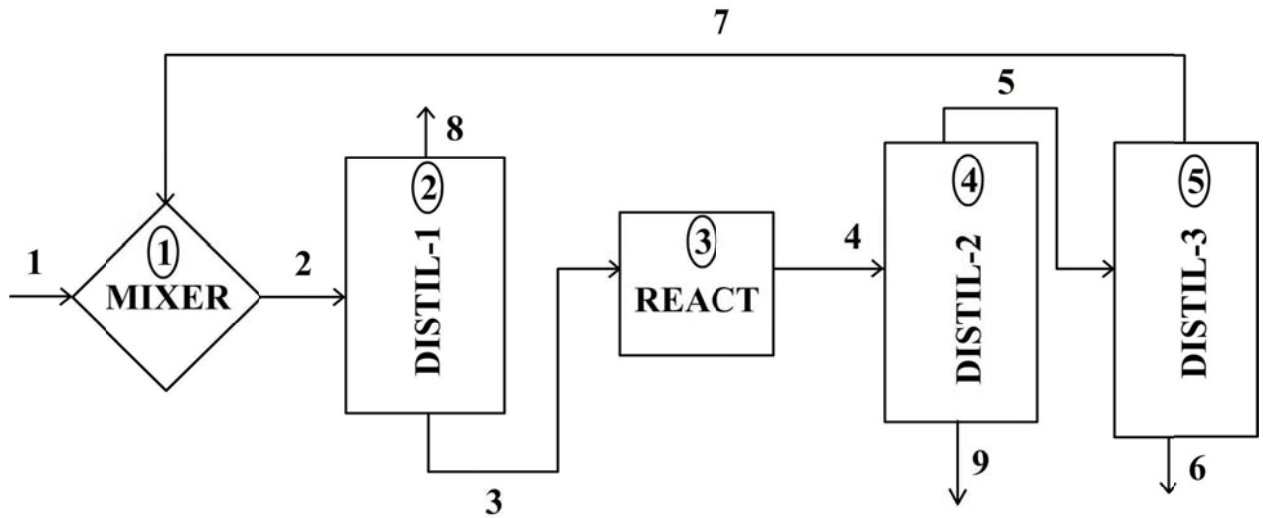
Fig. 1.5 Information Flow Diagram

Although the information flow diagram will generally resemble the process flow diagram, these will be different in some stream and units are not in both diagram. In the case of fig the surge tanks of fig are absent because the process is steady state and capital cost is ignored.