

CH0302 Process Instrumentation

Lecture 1 – Introduction

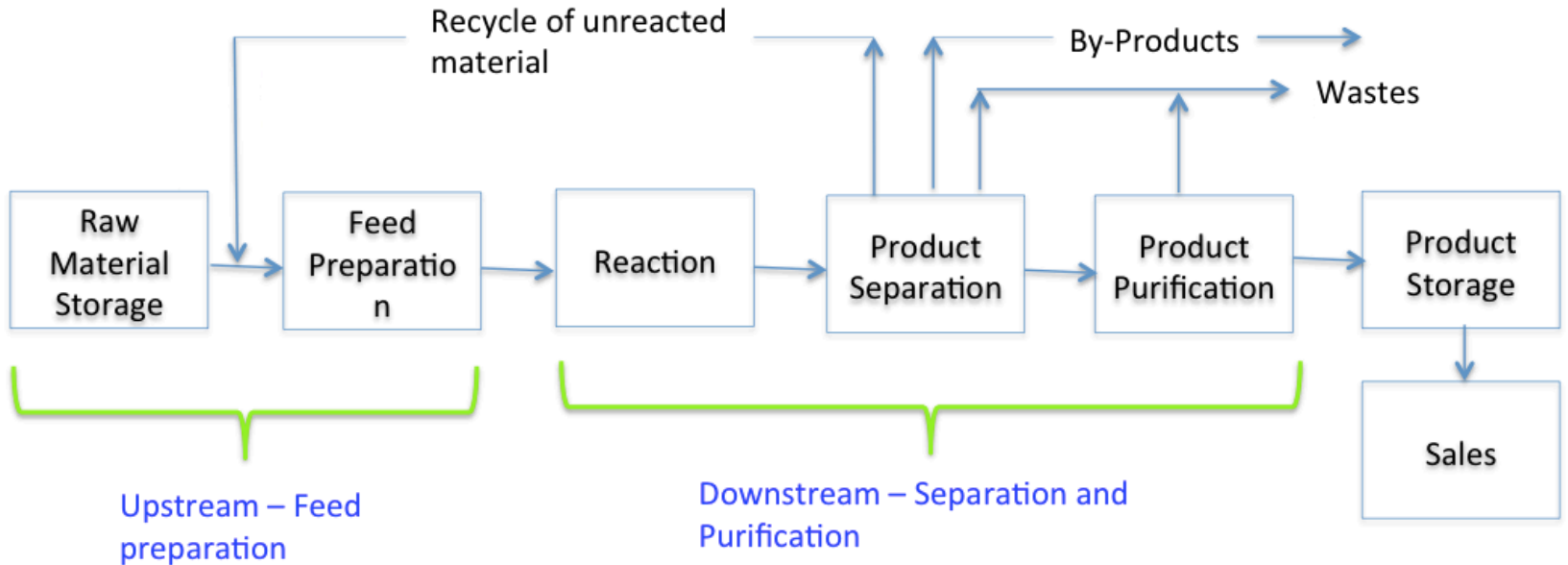


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Introduction - outline

- Anatomy of chemical production process
- Block diagram for a chemical production
- Process flow diagram
- Process/Piping and Instrumentation diagram
- Symbols used in instrumentation diagram

Introduction - Chemical production process



General anatomy of chemical production process

Introduction – Block Diagram in Chemical production process

- A block diagram is the **simplest form of presentation**.
- Each block represent a **single piece of equipment** or **complete stage of process**.
- Block diagrams are useful for representing a process in a simplified form in reports and text books, but only have **limited use in engineering document**

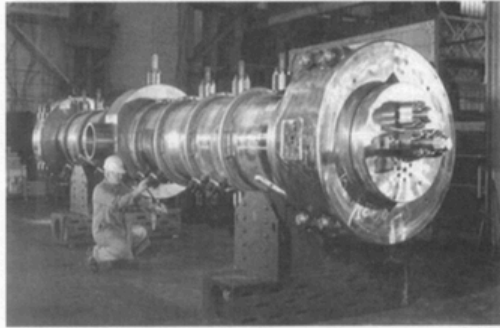
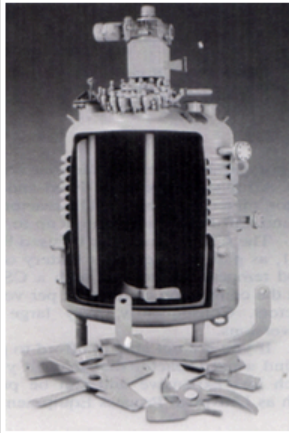
Introduction – Process Flow Diagram in Chemical production process

- A process flow is one in which all **incoming and out going materials and utilities** are shown.
- **Arrangement of major** pieces of equipment's and their interconnections operating conditions of each streams, such as temperature, pressure and composition.
- **Heated added or removed** in a particular equipment
- **Any specific information** which is useful in understanding the process.

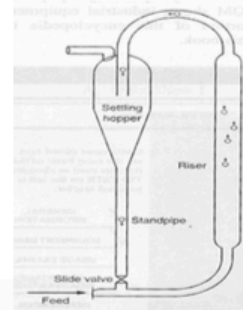
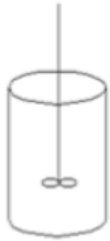
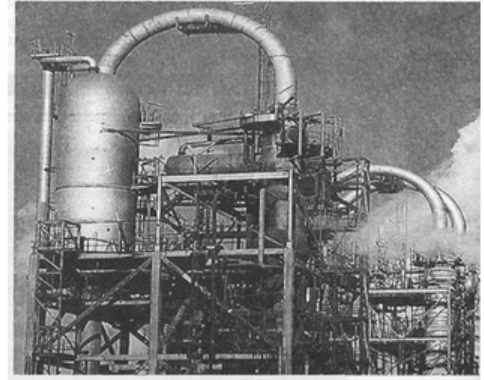
Introduction – P&I'D- Process/ Piping and Instrumentation Diagram

- Piping/Process and instrumentation diagram shows the engineering details of the **equipment, instruments, piping, valves and fittings; and their arrangement**
- P & I also shows the arrangement of the process equipment, instruments, valves, control loop and other fittings.
- For simple process, the **utility (or service) lines** can be shown on the P&I diagram. For complete process, separate diagrams should be used to show service line.

Introduction – Schematic representation



Polyethylene reactor; this 16-in inner-diameter reactor is designed to operate at 35,000 psi and 600°F; in operation, this reactor is in a vertical configuration. Courtesy of Autoclave Engineers, Division of Snap-tite, Inc.

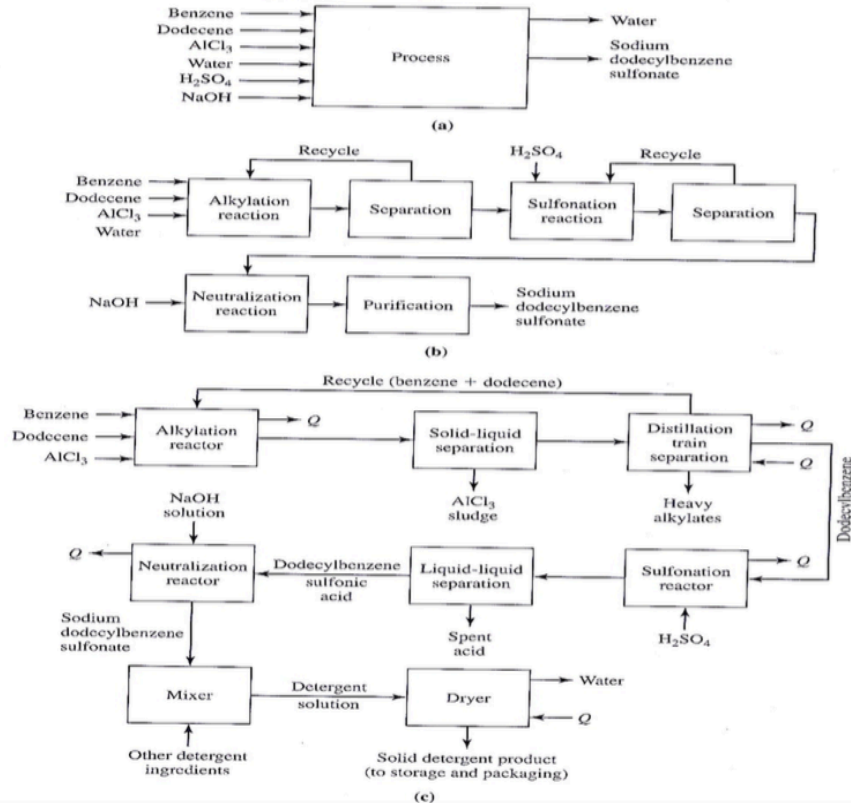


Design codes followed in the schematic representation of equipments in process flow diagrams are:

- British Standard, [BS1553](#) “Graphical symbols for general engineering”
- American National Standard Institute, [ANSI](#)
- German Standard, [DIN 28004](#)

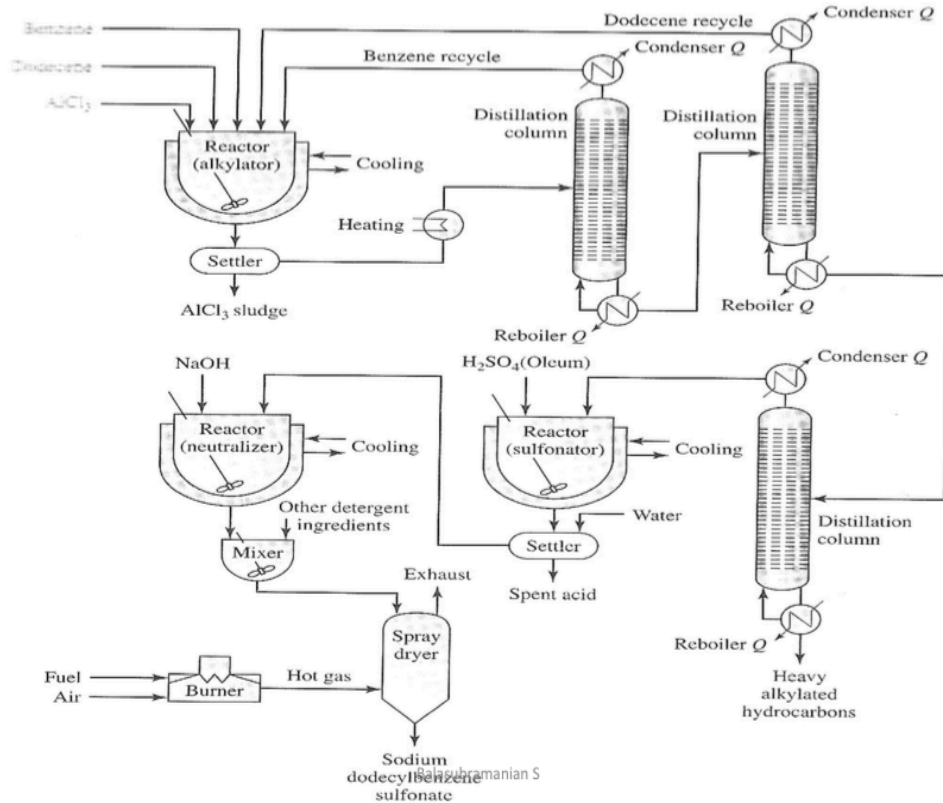
Introduction - Block Diagram

Manufacture of Sodium dodecyl benzene



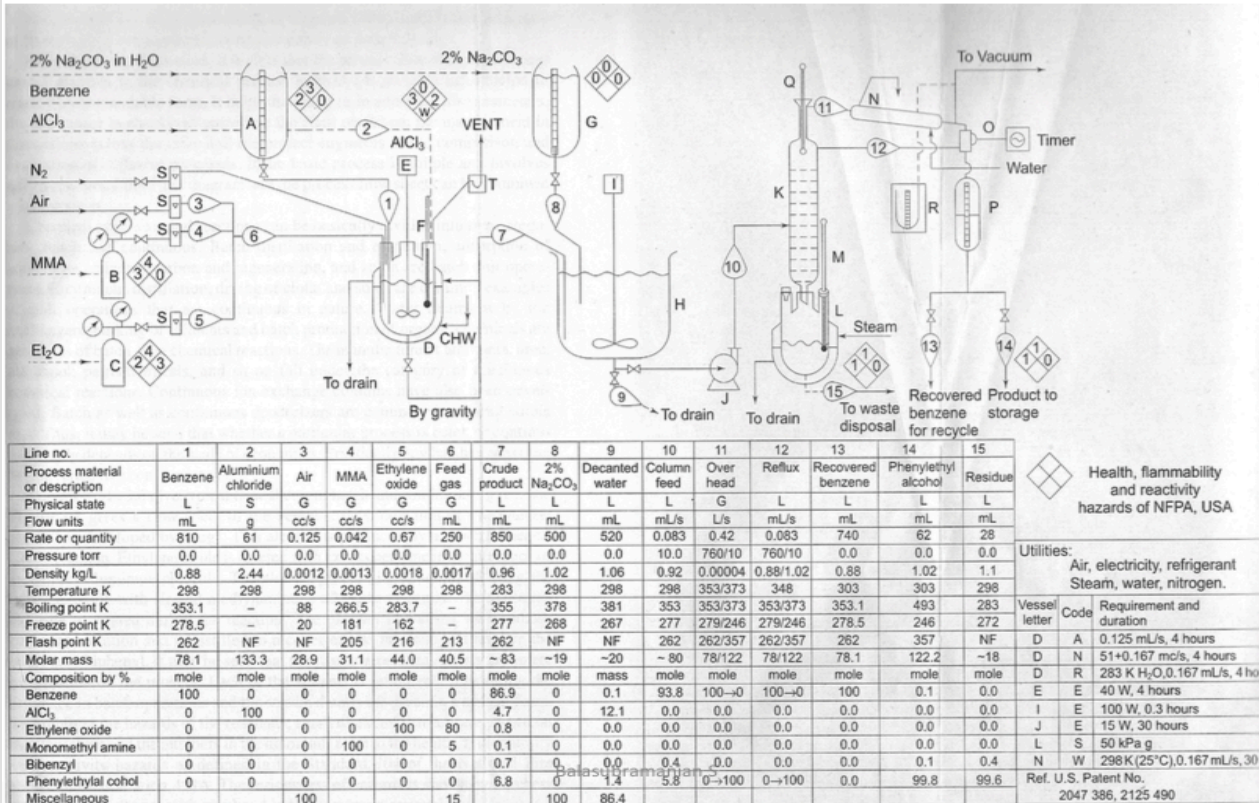
Introduction - PFD

Manufacture of Sodium dodecyl benzene

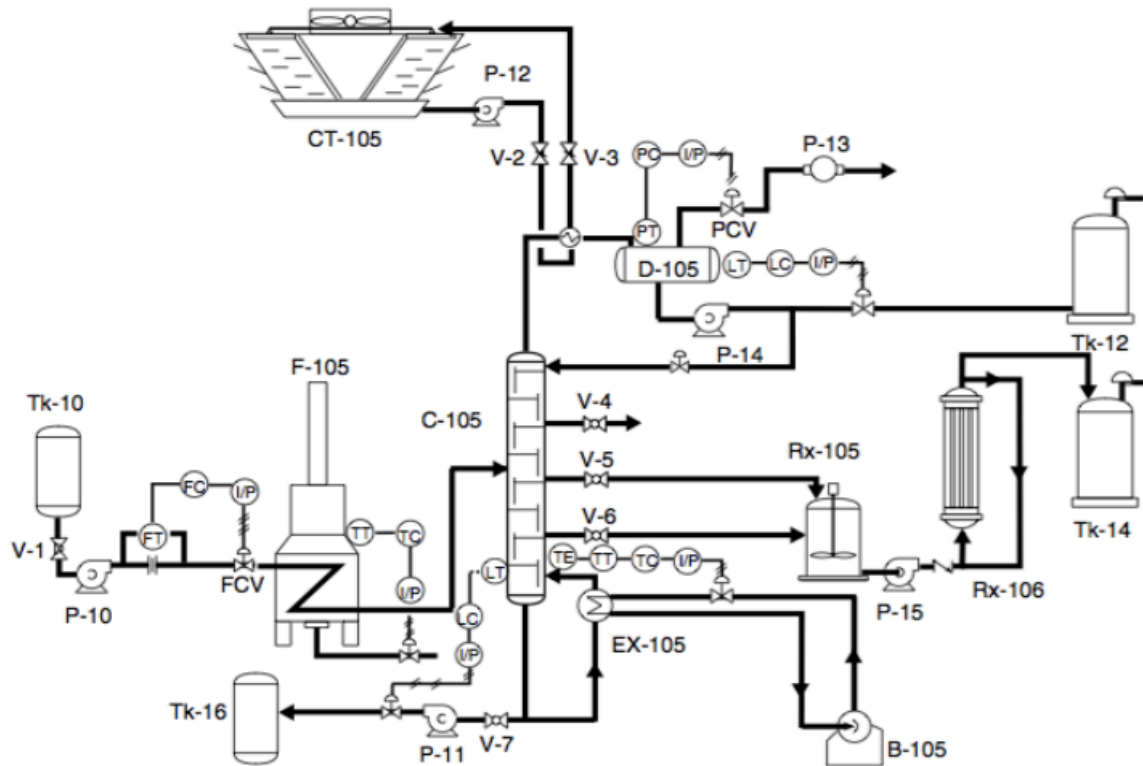


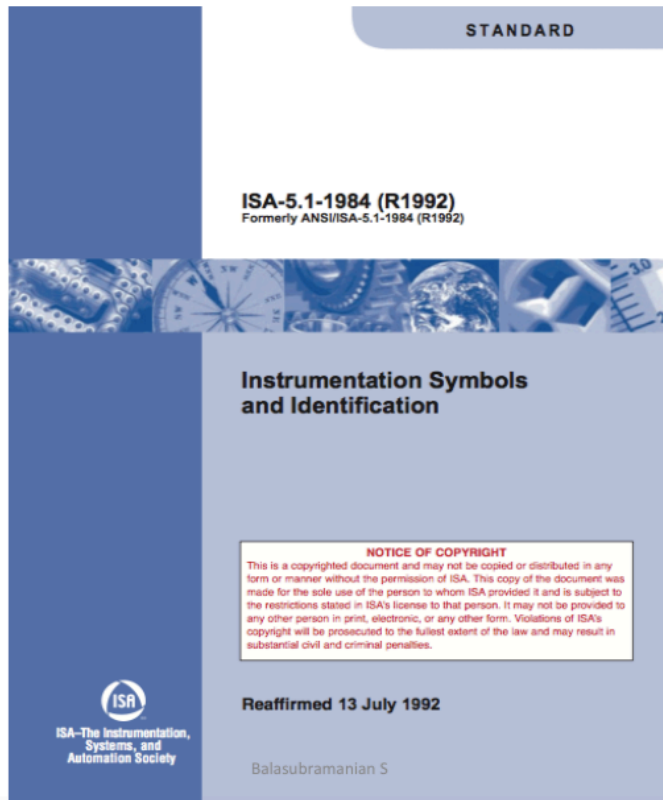
Introduction - PFD

Manufacture of Phenyl ethyl alcohol

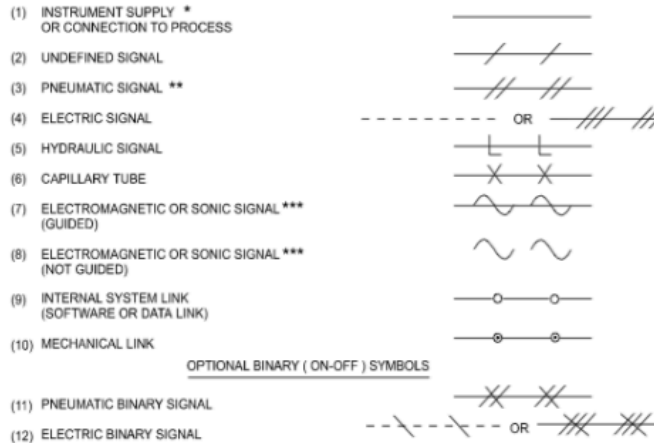


Introduction – P&ID





Introduction – P&ID



NOTE: 'OR' means user's choice. Consistency is recommended.

* The following abbreviations are suggested to denote the types of power supply. These designations may also be applied to purge fluid supplies.

AS - Air Supply	}	Options	HS - Hydraulic Supply
IA - Instrument Air			NS - Nitrogen Supply
PA - Plant Air			SS - Steam Supply
ES - Electric Supply			WS - Water Supply
GS - Gas Supply			

The supply level may be added to the instrument supply line, e.g., AS-100, a 100-psig air supply, ES-24DC, a 24-volt direct current power supply.

** The pneumatic signal symbol applies to a signal using any gas as the signal medium. If a gas other than air is used, the gas may be identified by a note on the signal symbol or otherwise.

*** Electromagnetic phenomena include heat, radio waves, nuclear radiation, and light.

References

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3. David M. Himmelblau, James B. Riggs. (2009), *Basic Principles and Calculations in Chemical Engineering*, 7th Prentice Hall India, Pp. XXV.
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5. Bhatia B. I and Vora, (1999) *Stoichiometry*, Vol. 6, 4th Edition, Tata McGraw Hill, Pp. 130.
6. Instrumentation Systems and Automation society ISA-5.1-1984 Standards.