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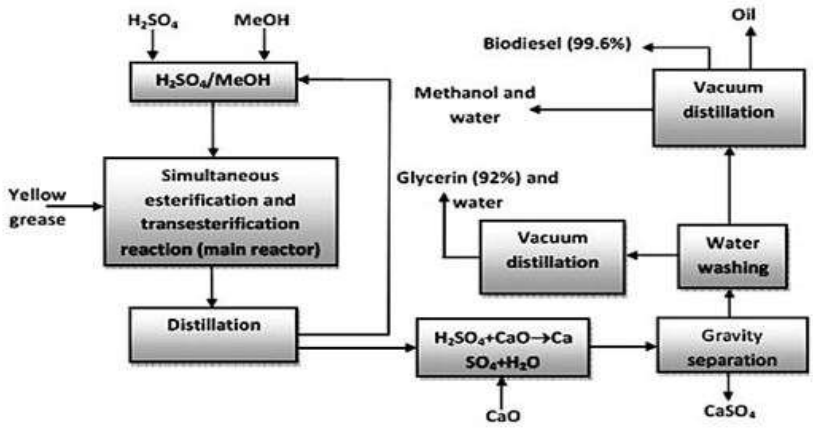
1) The Three Types of Process Diagrams

Process Diagrams are fundamental requirements for project design and engineering. There are three types of process diagrams:

1. Block Flow Diagram (BFD)
2. Process Flow Diagram (PFD)
3. Process and Instrumentation Diagram (P&ID)

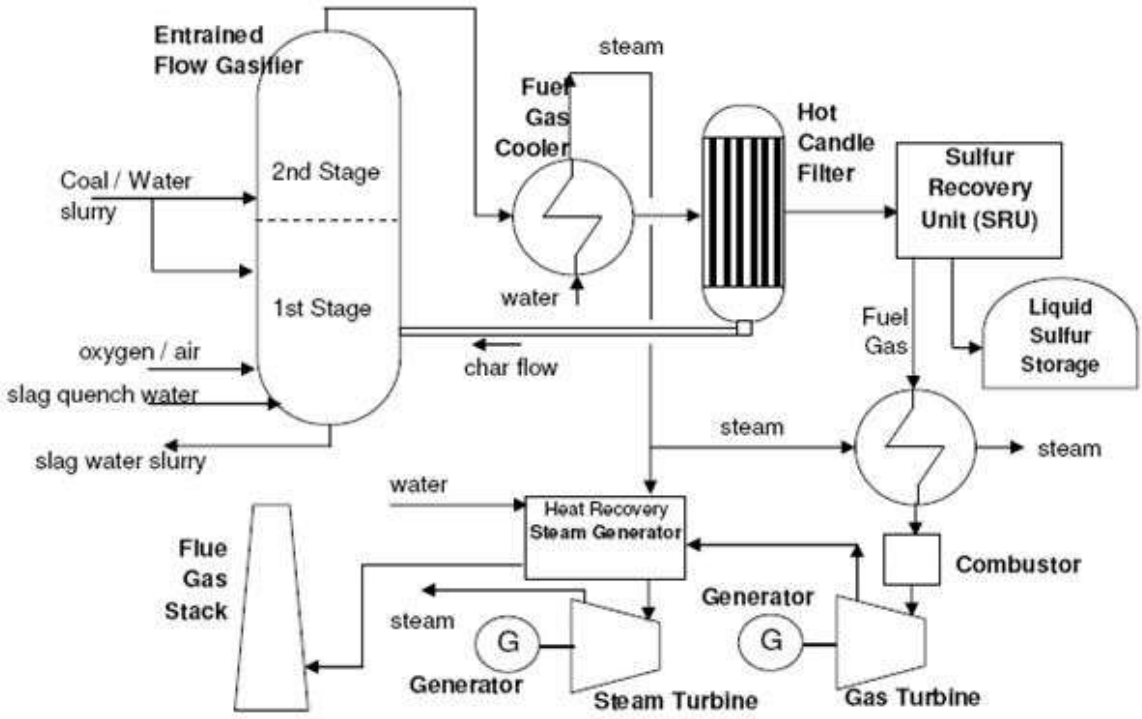
Block Flow Diagram (BFD)

The Block Flow Diagram is the simplest form of Flow Diagram which provides an overall view of a process. The diagram usually resembles an organized chart composed of text enclosed boxes, process commodities and flow arrow.



Process Flow Diagram (PFD)

The Process Flow Diagram goes a little further than the Block Flow Diagram in that it provides more detail about major equipment, sub systems and flow path. The PFD can also include the pressure and temperature information as well as main points of control.

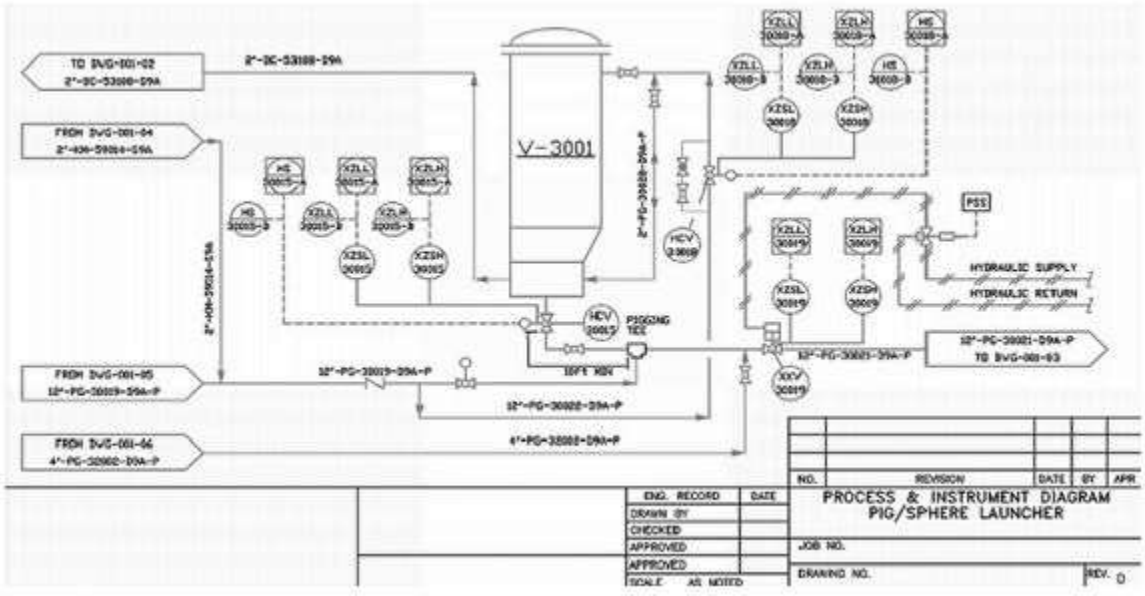


Process & Instrumentation Diagram (P&ID)

A process and instrumentation diagram, also known as a P&ID, is a technical drawing of a process. It uses graphical symbols for equipment and piping together with graphical symbols for process measurement and control functions. A P&ID's information typically spans multiple engineering disciplines and is a pictorial representation of piping and instrument details, safety and regulatory requirements, start-up and operational information, as well as control and shutdown schemes.

P&ID's include the following information:

- Permanent start-up and flush lines
- Flow directions and interconnection references
- Control inputs, outputs, interlocks and control system input
- Interfaces for class changes
- Identification of components and subsystems
- Instrumentation and designations
- Mechanical equipment with names and numbers
- All valves and identifications
- Process piping, sizes and identifications



2) Function and purpose of P&IDs

The objective of the P&ID diagram is to show the necessary information in order to understand the relationship between the conceptual design of the process, developed through the PFD and HMB diagrams, with reality.

PFD and HMB have only a minimum of information related to the physical aspects of the pipeline or the instrumentation of a system. The P&ID provides the link between the conceptual and the actual.

At design stage:

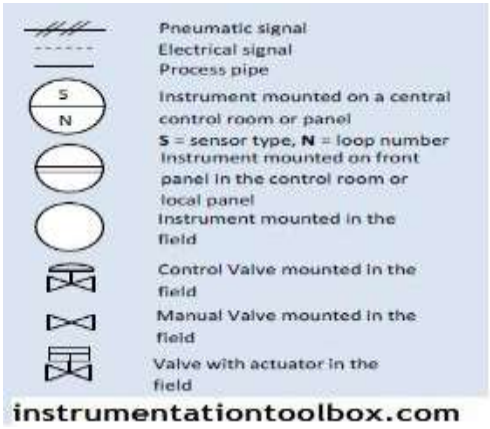
- Defines the design basis for Piping and Instrumentation disciplines. It is used as a document that defines the base process, from which all the engineering, manufacturing, construction and operation will be developed.
- Serves to show and agree the operating and maintenance features between Engineer and Owner or between Engineer and Vendor.
- Serves to show the interface with equipment/package vendors.
- Perform HAZOP design/review. It is used as a reference document for the management of process safety information (PSI) in Process Safety Management (PSM).It allows obtaining the necessary information to be able to analyze the hazards of the process, the potential failures and the existing safeguards in order to minimize the greatest number of errors in operation, design or humans.

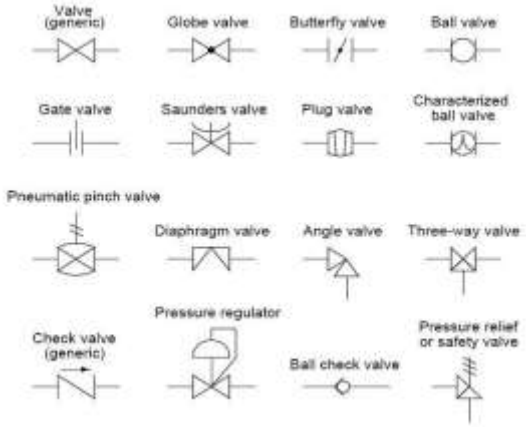
During operation:

- Reference diagram for operator, work permit, plant modifications etc.
- Process technicians use P&IDs to identify all of the equipment, instruments, and piping found in their units.
- New operators or technicians use these drawings during their initial training period. Knowing and recognizing these symbols is important for a new operator/technician.

- Train Process Operators. Part of the training would pose situations and require the operators to be able to describe what specific valve should be changed, how it should be changed, and what to observe in order to monitor the effects of the change.
- Support document in the development of operation and maintenance procedures.
- Development of start-up/stop procedures where the plant is not under the influence of the installed process control systems.
- During SAT, as a checklist against which each item in the plant is checked.
- Instrumentation and Control Systems Maintenance. The process and instrumentation or piping and Instrumentation diagram (P&ID) is probably the document most used by instrumentation and control system maintenance personnel.
- Instrumentation engineering. The P&ID diagram is the main and almost ideal document to synthesize all required measurement and control functions.
- Mechanical engineers and civil engineers will design and install pieces of equipment.
- Instrument engineers will specify, install, and check control systems.
- Piping engineers will develop plant layout and elevation drawings.
- Project engineers will develop plant and construction schedules.

3)


Pneumatic signal
Electrical signal
Process pipe
S
N
Instrument mounted on a central control room or panel
S = sensor type, N = loop number
Instrument mounted on front panel in the control room or local panel
Instrument mounted in the field
Control Valve mounted in the field
Manual Valve mounted in the field
Valve with actuator in the field
instrumentationtoolbox.com


Valve (generic)
Globe valve
Butterfly valve
Ball valve
Gate valve
Saunders valve
Plug valve
Characterized ball valve
Pneumatic pinch valve
Diaphragm valve
Angle valve
Three-way valve
Pressure regulator
Check valve (generic)
Ball check valve
Pressure relief or safety valve