

## Process Flow Diagrams

Process Flow Diagrams (PFD) are the designer's means to show the changes that occur in converting feed to product, the equipment required to effect those changes and the change in composition, temperature and pressure of streams as they move through the process. Process Flow Diagram's are a "work in progress" over much of the course of a feasibility study and are only finalized at some point in the Front End Engineering Process.

The first step in constructing a PFD is to produce a block flow diagram.

### **Block Flow Diagrams**

The first step in the production of a PFD is to show the major process steps in the form of a block flow diagram.

Typical blocks consist of:

- Feed preparation
- Adjustment to reaction conditions
- Reaction
- Quench
- Gross Separation
- Separation of Co-products from Product
- Product purification
- Co-product purification
- Destruction of undesired byproducts

Not all of these blocks will be in your particular process. Just show those that are..

Using the block flow diagram as a starting point, you can then decide what equipment is required to accomplish the functionality of each block.

### **Process Flow Diagrams shall show the following as a minimum:**

- Principal process equipment, marked with equipment numbers, service, operating temperature and pressures and with process duty where applicable.
- Main process streams and lines essential for understanding the material balance around each piece of equipment. All such lines to be designated by stream numbers contained within a diamond. Bold lines should be used sparingly, indicating the path of the main process flow.
- The destination of byproduct streams and waste streams.
- Chemical, liquid catalyst and additive systems, where used for process reasons.
- Primary means of control.

- Heat duties for exchangers and heaters.
- Pressure profile across the flow loops
- For columns and vessels show the major dimensions, number of trays or packed beds with heights. Trays shall be numbered from top to bottom.
- For fixed bed reactors, there shall be an indication of the number of reactor beds and catalyst volumes.
- Motive equipment suction and discharge conditions with estimated driver power ratings.

### **Presentation of Stream Data**

The following stream data is required for each numbered stream:

- Molar flow rate. For vapor streams each component rate will be required
- Physical phase of the stream,
- Stream volume rate at flow and standard conditions
- Mass flow rate
- Density at standard conditions
- Temperature
- Pressure

Temperature, pressure and mass flow rate should be shown on the stream using the following convention:

|                |           |
|----------------|-----------|
| Temperature    | Rectangle |
| Pressure       | Circle    |
| Mass flow rate | Trapezoid |

All other stream data should be contained in a table at the bottom of the flow sheet.