



PROCESS FLOW

Process Flow Diagram (the following are the steps from start to completion of project):

Assumption: Marketing/sales effort has taken place. Client is already interested in specific technology.

Pre-project

- Client provides all pertinent information for desired plant, including desired plant capacity; types of product[s] to be produced; available raw materials; available utilities; local environmental conditions (i.e. climate, hurricane potential, seismic activity, etc.)
- A set of technical deliverables are mutually agreed upon; these are incorporated into the contract between the parties.
- Contract executed; first payment received.

Typical time frame: approx. 4 weeks

1st Phase of Project: Process Design Package (PDP)

- Prime 3 delivers to client a simplified process description for review and approval.
- Upon approval and sign off by client, begin Process Design Package.

- The PDP begins with Heat and Material Balance (HMB). Upon completion, HMB delivered to client for approval. Time to complete HMB: 4 weeks – 3 months.
- From the HMB a process flow diagram is developed, including a detailed equipment list, raw material consumption, average utility consumption, detailed process description, start up and shut down procedures, control logic parameters, troubleshooting info.
- PDP completed and provided to client for approval.
- PDP is delivered electronically and both hard copy and CD/DVD.

Time frame: 3–6 months

2nd Phase of Project: Basic Engineering Package (BEP)

- Prime 3 and client agree upon a set of deliverables for the BEP. In almost every instance, the BEP will be designed by Mustang Engineering.
- Design Process and Instrumentation Diagrams (P&ID's), which are submitted to client for review and approval.
- Upon approval of P&ID's, the development of a plot plan of the overall plant is started; preliminary plot plan.
- Once preliminary plot plan is laid out, exact equipment is then specified; then exact utility requirements are specified.
- After equipment and utilities are specified, electrical diagrams are completed.
- After completion of electrical diagrams, piping layout begins.
- Piping layout is completed.
- After piping layout is completed, plot plan is finalized.
- Depending on the agreed upon deliverables, several other items may be included.
- BEP is completed and delivered to the client for approval in electronic form as well as hard copy and CD/DVD.

Typical time frame: 6–9 months

3rd Optional Phase: Pilot Plant Design (if client desires a Pilot Plant, this phase will run concurrently with the 1st Phase and will in most instances be sub-contracted to Mustang)

- Parties agree upon deliverables for Pilot Plant such as size, type of products to be produced, and what they are looking to achieve.
- Typical Pilot Plant design goals include: a. New process development b. Process demonstration and process economics c. Technical service and problem solving for an existing or planned commercial plant d. New product development e. New market development and market assistance (sample preparation for new and existing clients)
- Engineering steps to complete Pilot Plant design: a. Complete process flow diagrams b. Complete heat and material balance c. Mutually define materials of construction d. Complete process and instrumentation diagrams e. Size and specify custom (non-catalog) major equipment f. Size heat exchangers and heaters g. Size major process lines h. Size major utility lines i. Size control valve trims j. Size safety valves and rupture disks k. Size major vent lines l. Complete process bill of materials for all P&ID tagged items m. Complete 3D layout drawing for major equipment n. Complete Pilot Plant Design Description Document o. Provide Final Design Package consisting of all deliverables electronically and both hard copy and CD/DVD

Typical time frame: 3 – 4 months