Design of Pumping Systems

Master Checklists

Critical Variables Underlying Pumping Systems Design

- Temperature – full range of conditions in the system.
- Pressure (Heads) – full range of conditions in the system.
  Net positive suction head required and available from the pump.
- Chemicals and varying concentrations – as also for compatibility with pumps, other equipment and piping in the system.
- Pressure rating of the equipment at the maximum system temperature.
- For plastic pumping systems the inter-relationship between the temperature, rated pressure and the chemical compatibilities requires a careful review, as the inter-relationships are complex.
- Required flow ranges and special flow control requirements for operational time cycles.

Pumping Systems Design – Equipment Selection Stages

Prepare systems analysis, information analysis, scope analysis, risk analysis
Start with flow rates and range, SG, viscosity for each pumping stage. State suspended solids details if present.
Select materials for pumping system. Standard is Carbon Steel or 304 SS (stainless steel) for piping.
Select the basic pump type, from the viscosity, heads and flow rates range and power consumption curves.
Select motor power and choose RPM recommended for the said process and equipment chosen.
Select basic internals – impeller type, etc as standard for said process.
Select internals and impeller positions for application such as suspended solids (e.g. recessed impeller)
Check that there are no issues of crystallization, floating light liquids, foaming or de-aeration to consider.
Check system details and review scope analysis studies for total system design. Prepare upgraded scope.
Review total system design with equipment specialist suppliers to enable detailed quotations/pricing.

General Pump Risk Check-list

- Can the pump discharge pressure exceed the design pressure of the casing?
- Can the pump discharge pressure exceed the design pressure of downstream piping or equipment?
- In parallel pump configuration, can leakage through an idle pump's discharge check valve over-pressure the suction valve, flange and connecting piping for the idle pump?
- Can the pump design temperature be exceeded?
- Can pump suction be isolated from the feed source for maintenance?
- Is backflow adequately prevented?
- $NPSH_A$ been calculated? Were cavitation modifications necessary?