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### Direct Query: Pump Suction Line



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**Top Contributor**

(1) While looking at P&IDs of 4 different pumps, I find 2 of them have Utility Connection (UC) at pump suction and for other 2 no UC. Can the UC at suction also be used for pump.

Response: Utility connections are usually given to purge the contents of the pump, after a shutdown before opening the pump casing. In the 4 pumps 2 without UC are oil/ condensate; 2 with UC are Amine and Low Temp light ends. For hot and heavy viscous fluids, you may give UC so that it does not congeal. Look at the service - that is - nature of pumped fluid.

(2) Some P&IDs show 1:200 slope and flat top eccentric reducer in pump suction line. Some do not show this. Why?

Response: Good practice with saturated or boiling liquids that are likely to release vapour upon pressure reduction. Any vapour released will move up towards source without accumulating near pump eye causing vapour lock. If you allow vapour accumulation, there is a potential for the accumulated vapour to flow in to the pump suction and vapour lock the pump. You don't need it with stabilized oil or water.

Pump NPSHA - net head above boiling point vapour pressure show may suggest that there should not be any vaporization. But pumps may run at a higher flow rate than design, end of the curve operation, +/- 20% in friction calcs, dissolved gas coming out of solution, final pipe routing different than assumed in calc. Countless causes for vapour in suction line

(3) Some P&IDs specify straight Run of 5D to 10D at pump suction.

Response: Good practice. I have not seen it specified; It should be specified.

(4) One P&ID shows that the suction gate valve should be installed horizontally. Why?

Response: Same reason as flat top eccentric reducer - not to allow accumulation of vapour within the valve body. Note: gate valves are supplied for vertical installation or within 5 deg of it. Any other orientation should be communicated by your piping engineer to the supplier, as per API-600, to provide special machining to achieve good fit between guiding surfaces of disc and body. Otherwise galling may occur and valve may require repair/replacement. But piping engineers fail to specify it assuming valves will function in any orientation.

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**Saeid R. Mofrad**

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**Top Contributor**

1) For pumps in HC and toxic services, UC (for nitrogen purging) is required for maintenance. I feel pump UC can be much simpler than what we provide on process vessel (may be single valve with blind) because it is used after draining the liquid and upstream vessel UC can be used during initial start up.

For the canned pumps, UC is needed for evacuating the liquid content of the can (concrete pit underneath the pump) to drain system. UC arrangement is similar to vessel UC.

Nitrogen purging is required to sweep the air out (after maintenance) when contamination with air is not tolerable or fluid is above its auto ignition temperature (AIT). UC arrangement is similar to vessel UC.

Washing oil is needed to push the solidifying liquid to drain system. Typical examples are crude column bottom or heavy gas oil pumps. UC arrangement is similar to vessel UC.

2) In my opinion, slope requirement at pump suction is just extra cost and pain for piping designers. If you would like to achieve free venting (bubble freely rising to suction vessel) in the pump suction line, the velocity should be limited to 0.3m/sec which is much lower than pump suction line velocity limit. Furthermore, the first 3000mm of pipe should be vertical (before any horizontal run) which may not be possible for all pumps.

I believe for the pump suction line, in order to make sure that no vapor will be accumulated during normal operation and pump suction line is easily filled during start up:

- The suction line most preferably should go constantly downward towards the pump (Free Draining). Bear in mind that slope is not required in free draining. Even horizontal runs are acceptable.

- If free draining not possible, the suction line high point should be limited to the upstream vessel outlet nozzle (Gravity Flow)

3) 5-10D is a good rule of thumb. However, I think it is better not to be shown on the P&ID and let it be finalized between the rotating and piping departments. The reason is:

- 10D is the most conservative length which may be hard to achieve in reality as far as piping modelling is concerned (especially for the large suction pipes). In some cases only 1.5D suffices.

- The actual straight length depends on the actual piping arrangement and vendor requirements. It varies based on the type of the last fitting before the pump nozzle (elbow, reduce, valve, etc), the orientation of pipe (vertical or horizontal elbow, inlet line in the same plane as pump shaft or perpendicular to pump shaft), and the type of pump (single or double suction), etc.

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S M

Saeid: You should capture this in your Board Notes. I'd prefer the 5D-10D shown. Otherwise it will be forgotten. Only if shown, then it would be provided for as best as possible and the negotiated D can be in the AFC.

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