# VALVE NEWS AND VIEWS

Fetterolf Corporation • P.O. Box 103 • Skippack, PA 19474 • P-610-584-1500 • F-610-584-5904 Vol. X No.17

# Tank/Drain Valve Installation: The Importance of Proper Planning

Proper performance from a flush bottom drain valve on a reactor vessel or a pipe line can only be achieved when the valve is properly applied and properly mounted. The same thing is true for Ram-type Sampling Valves. All too often the valve fails to perform as expected because of the lack of sufficient planning prior to installation.

**Careful consideration must be given to the entire installation, not just the hardware involved.**

1. What is the fluid flowing? Is it free flowing or is it extremely viscous?
2. Does it contain solids-How much and how large?
3. Is it sticky and will it adhere to the walls of the vessel, drain valve and piping?
4. Will it solidify on cooling?
5. Should the valve and piping be heat traced?
6. Is the metallurgy correct for the construction material selected? Does only the wetted portion of the valve during the reaction require special consideration?
7. Has proper actuation been selected-manual pneumatic electric, hydraulic?
8. Is there sufficient air pressure, electric power, or hydraulic pressure and volume available at the vessel/valve location?
9. Is there sufficient headroom under the reactor to install the valve and its actuator?
10. Has the valve been properly sized for the flow required or time required to empty the vessel or to drain the pipeline?
11. Has the proper ANSI pressure rating been selected based on the design pressure and temperature and the most recent issue of ANSI B16.5? Will it cover upset conditions?
12. Has a reputable valve manufacturer been consulted to obtain his advice on valve selection? (Any good valve supplier will freely provide this information).

Now that these twelve questions have been answered, and there may well be many more due to the particular details of the project, how should the valve be mounted on the reactor so that it performs as expected?

The basic design of a Flush Bottom Drain Valve is just as it says in its name, i.e. flush to the bottom of the reactor or pipeline. It should provide full drainage of the vessel without any dead spots or stagnant areas where material might collect to deteriorate and cause valve malfunction or possibly contaminate the next batch of material drained. It should also provide absolutely drop tight, dead shutoff in the closed position. The plunger (RAM) should also push

*continued on page 2*

## Some things to think about

I'm a problem solver. If I don't solve a problem, there was a reason. Either I anticipated incorrectly, planned improperly or missed the key factors because I was worrying about secondary issues.

*- General Colin Powell*

The ultimate victory of tomorrow is democracy, and through democracy, education, for no people in all the earth can be kept eternally ignorant or eternally enslaved.

*- Franklin D. Roosevelt*

It is amazing how much time can be lost by engineers arguing about what the customer needs. You can save all that time by just asking the customer.

*- Allen J. Lauer Varian Associates*

If you always focus on your customers, you may never need to fire a shot at your competition.

*- Guy Kawasaki Apple Computer*

# Tank/Drain Valve Installation: The Importance of Proper Planning
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any material in the valve body back up into the reactor to assure there is no residue in the body to decay and spoil or discolor the next batch on draining. Flush ports in the body can also help assure total drainage from the valve body.

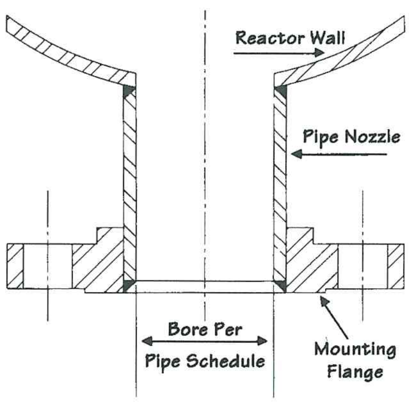



**Figure 1**
***Pipe Nipple and Flange***

Perhaps the most common method of mounting a drain valve on a vessel is the use of a pipe nipple and flange as shown in Figure 1. This is simple and inexpensive but consider the following – there is a very large volume in the nipple where material will collect and not be involved in the mixing and reaction in the vessel. On opening the valve, this material may form a "plug" which will not allow proper drainage or will go downstream as an unmixed or unreacted plug, and could cause great problems with product quality.

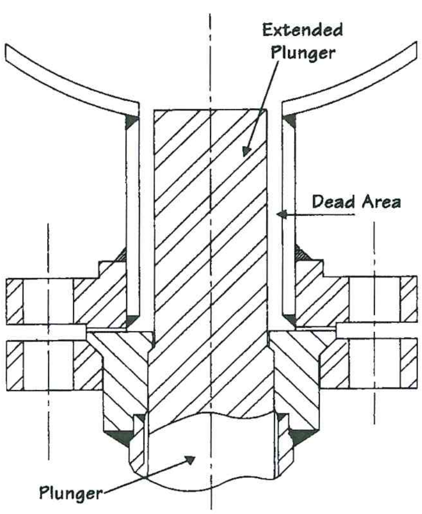



**Figure 2**
***Extended Plunger***

A partial solution to this situation is shown in Figure 2. An extended valve plunger is utilized to fill the pipe nozzle and this cut down on the dead area where material can collect. This is true, but what about the area between the O.D. of the plunger and the I.D. of the nozzle? Here material in the reactor can collect and again never be part of the reaction and could cause problems as mentioned above. Depending on the type of material, it could solidify on cooling so that it will actually "grab" or seize the plunger so that the valve cannot be opened!

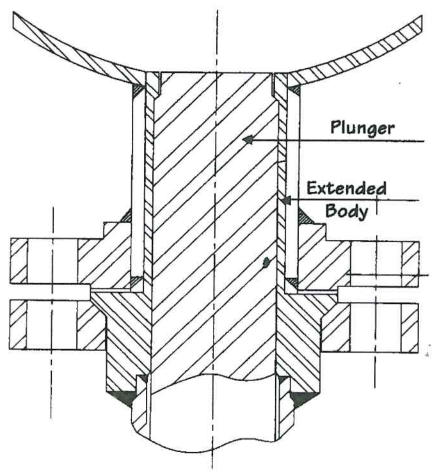



**Figure 3**
***Extended Body***

The ultimate solution to this situation is the use of an extended body as shown in Figure 3. Here the extended body extends thorough the nozzle to be flush with the inside of the reactor, and the end of the plunger is also flush with the inner vessel wall. There is no area in the vessel where material can collect and cause any problems. The minimal material between the O.D. of the extended body and the I.D. of the nozzle is trapped and cannot go anywhere until the valve is removed from the nozzle.

When specifying an extended body on a drain valve, one must be very careful to assure that the extended body will, fit inside the nozzle size selected. The valve manufacturer must be contacted to be sure the valve of his design will fit properly. Remember that the extended body is a pressure-containing part as it sees full reactor pressure on its O.D. and thus a 2" valve may not fit into a 2" SCH 4Ø pipe nozzle. Also, the O.D. of the extended body increases as the pressure rating of the valve increases. This also should be checked with the valve supplier. Be careful, the nozzle I.D. could be much smaller than expected unless bored to a toleranced dimension.

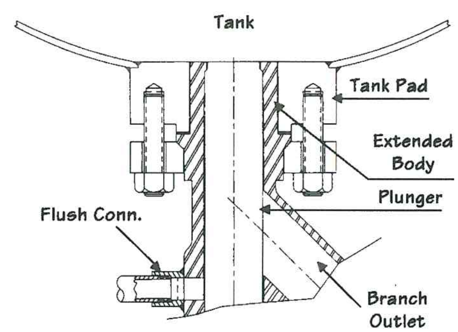
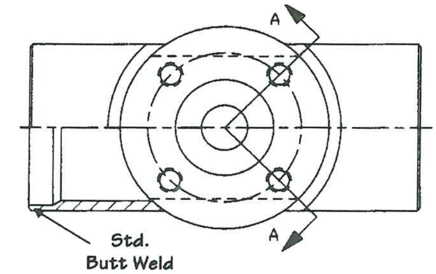



**Figure 4**
***Flanged Tank Pad***

There must be sufficient room to install and remove the flange bolts when a pipe nozzle is used in all of the previously discussed installation methods. A much easier and less expensive compact design is the use of a flange pad as shown in Figure 4.

In this type of installation, a flange pad is welded onto (into) the reactor bottom at the time of reactor manufacture. Because the pad is bored to accept a given valve, the bore diameter may be very carefully toleranced (+ 0.020") so that the chosen valve will fit exactly and the opening between the extended body O.D. and the pad bore I.D. will be kept to a minimum. Because studs are threaded into the pad, the pad thickness will be a great deal less than when bolts/nuts are threaded through two flanges. An excellent way to assure a precise fit is to have the valve manufacturer provide the pad. By supplying both, a perfect fit in the



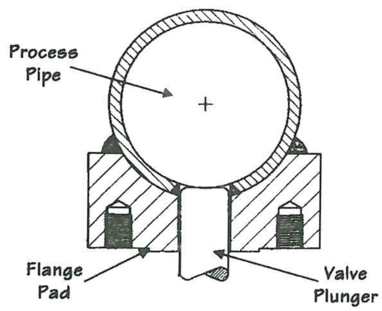




**Figure 5**
***Pipeline Pad***

field is assured. The overall length of the valve assembly from body mounting flange to the end of the actuator is also lessened a few inches should installation be extremely tight.

Figure 5 illustrates the use of a pad in a pipeline where the valve is used to drain a pipeline or to inject another fluid into the line. The valve must always be smaller than the line itself. A 3" valve cannot be installed in a 3" line due to the large flange diameter compared to the line diameter.

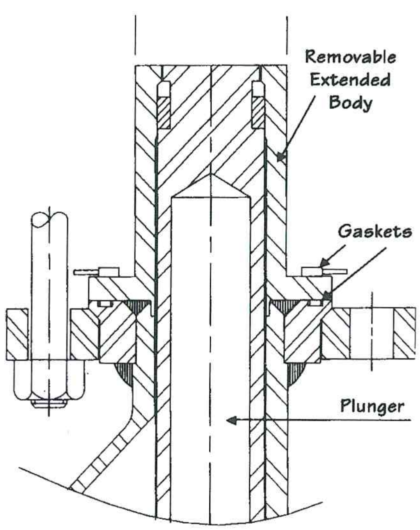



**Figure 6**
***Removable Extended Body***

A variation on the use of the extended body design is the use of a separable extended body, similar to that shown in Figure 6. The extended body is a separate piece, clamped between the reactor mounting flange and the body flange on the valve. The extended body may now be replaced when necessary at minimal expense. One must be very careful in the design and use of removable extended bodies. The thickness of the flange must be increased over standard and bolt material must be of extra strength due to the additional closing forces placed on the entire

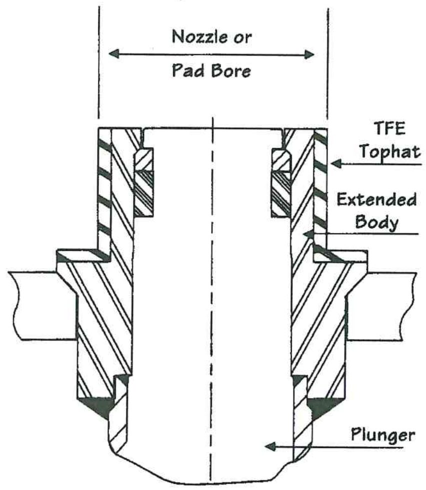



**Figure 7**
***TFE "Top Hat"***

assembly when the valve is tightly closed. Overlooking this consideration could cause catastrophic failure.

Another application of the removable/replaceable extended body is used when a noble alloy such as titanium or zirconium must be used as a wetted part when the reaction is taking place but is not required when the reaction is complete and the vessel drained. In this case, only the extended body and the top of the plunger need be of the noble alloy, the remainder of the valve being of a less expensive stainless steel.

When an extended plunger must be used, for whatever reason (product flowing, valve design selected, space limitation, etc.), a teflon "tophat" may be used as shown in Figure 7. Here a teflon insert fills the area around the extended body and inside the nozzle or pad to prevent unwanted product accumulation. The tophat also provides the mounting flange gasket.

Rising plug or "poppet" designs shown in Figure 8 frequently utilize the extended body/separable seat design. In this design, the plug or disc rises into the vessel on opening, frequently used to break a crust on the interior of the vessel/pipeline to allow discharge flow. Note that in this valve the plunger does not "rod" out the body on closing, thus a flushing port is usually provided.

As in any complex project design, the engineer should obtain all the expert help available. Then all options may be explained and all possible problem areas investigated prior to finalizing the design. This will make the bidding process more rapid and

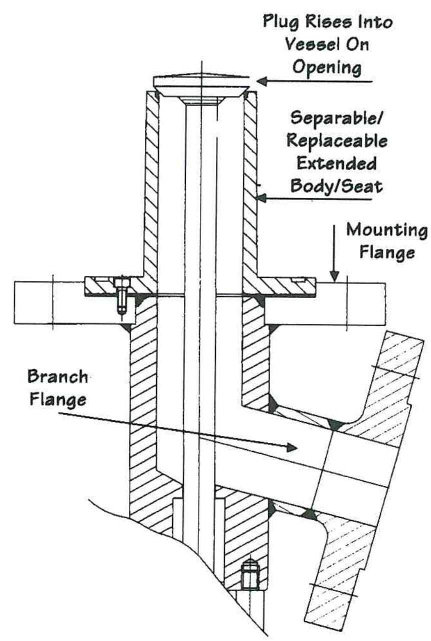



**Figure 8**
***Rising Plunger or "Poppet"***

eliminate questions during the proposal stage. Drawing approval time after purchase order award will also be decreased of even eliminated.

Contact the Fetterolf agent nearest you for assistance, or call the corporate office in Skippack, PA. or Houston, TX for engineering and product application help. They are knowledgeable and more than willing to offer assistance.

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