PUMP PROBLEMS

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MANY readers have expressed their appreciation for the articles we have presented in the last several issues under the title of "Pump Problems," and some have contributed ideas of their own.

We have also received many requests for complete detail design suggestions for tank truck pump installations, as well as for bulk plant layouts, with advice on the best possible piping arrangements for each use.

We are quite sure that at this time it would be impossible for anyone to present a perfect installation plan which would be adaptable to all the varying requirements and conditions to be found in this field. However, we feel that to point out the more important features necessary for successful operation, and to call attention to errors of construction which have been found undesirable, will do much toward bringing about an eventual standardization of installation practice of benefit to all.

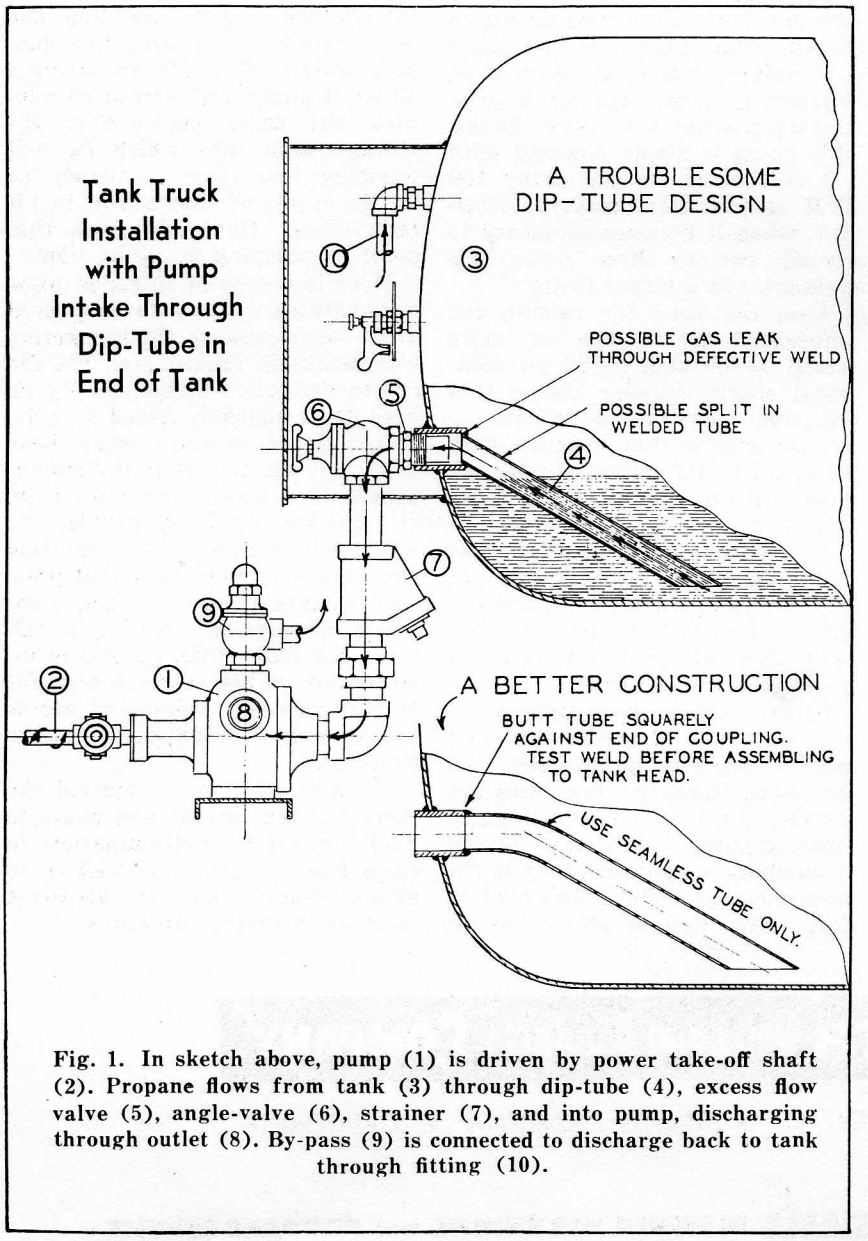

Fig. 1. In sketch above, pump (1) is driven by power take-off shaft (2). Propane flows from tank (3) through dip-tube (4), excess flow valve (5), angle-valve (6), strainer (7), and into pump, discharging through outlet (8). By-pass (9) is connected to discharge back to tank through fitting (10).

No doubt many plants now being built will have outstanding features of improved construction, while, at the same time, incorporating some errors which will prove troublesome. This, of course, is to be expected in any new field, and it is for this reason we feel that an exchange of ideas among those engaged in this work should be promoted and would be very helpful to the entire industry.

In this issue we wish to quote and comment on a few suggestions and questions which have been presented by our readers. Paul G. Boyd, vice president of Airlene Gas Co., Inc., Fulton, Kentucky, writes as follows:

"Your articles on pumping problems are timely and of value. Perhaps many companies have worked out such problems but each person can learn from the experiences of others.

"For example, several years ago we had considerable trouble with a pump vapor-locking while pumping liquid from the tank car to storage, and could not get all the liquid from the tank car either. Now we use both pump and compressor and build a 10-lb. head in the tank car before opening the liquid lines. Our flow from the tank car is 3,000 gallons per hour through a 2-in. liquid line."

The use of a vapor compressor to increase the head pressure in the storage tank, from which fluid is being pumped, should be very helpful, particularly where the existing lines to the pump are inadequate in size, or present considerable resistance. Any means to insure an ample supply of liquid to the pump intake is of the greatest importance, and we are sure Mr. Boyd's suggestion would prove an excellent solution in cases of pump starvation due to inlet piping restriction or to an inadequate gravity head.

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The manager of a B-P Gas distributing plant in Oregon writes:

"We have not yet figured out just what is wrong with our installation in which we have taken the return line from a differential valve back to the liquid line ahead of the pump. It may be that we will have to take this clear back to the supply tank."

We assume that this reader refers to the by-pass line. Particularly in bottling service, and wherever there is any appreciable volume of

fluid being by-passed, it is very important that this by-passed fluid be carried back to the tank. Otherwise, it becomes a means of increasing the temperature of the fluid in the pump, resulting in the formation of gas. This subject has been quite thoroughly covered in the September issue, and we urge that this system be followed.

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We have a communication from a Pennsylvania producer who describes his tank truck pump installation as one in which the pump takes its intake supply through a valve and dip-tube provided in the tank end. He states that he is unable to withdraw the last 20% of his tank capacity.

In our experience, the dip-tube type of tank construction has always been troublesome when used to supply a pump intake line. In practically every case examined, it appears that in the construction of this type of tank outlet, the diameter of the dip-tube has been reduced often to as little as half that of the exterior piping.

This has proven a serious restriction to pump intake supply, and it is an item of construction which it is very difficult to correct after once the tank is finished and put into use. For this reason, we suggest that the outlet for a pump connection be at the bottom of the tank, and advise that it be very ample in size for delivery needed.

In the particular case of this correspondent who is unable to withdraw the last 20% from his tank, it is our opinion that his trouble may not be due to restriction alone, since such a restriction would merely tend to reduce the discharge capacity. We think the trouble is more probably due to an incomplete weld of the dip-tube to the tank outlet fitting. We are making this guess because we have previously known of one other such case which was extremely difficult to analyze. We are illustrating this case in the accompanying sketch (Fig. 1) because wherever this type of design is followed, it is very important that some form of test be given these welded joints before final assembly is made within the tank or spherical container.

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Another reader has written as follows:

"Recently we installed a 100 GPM pump for unloading our transport. This is equipped with a 5 HP motor. We have tried on several occasions to use this same pump for filling individual bottles and small tanks. The filling operation is slow unless we set up our by-pass pressure to a differential of over 60 lbs. When we do this, we frequently burn out our fuses."

Trying to use a large transfer pump for the filling of single bottles or tanks with the small fittings usually provided would not be good economy for several reasons which we will point out. In the first place, a transfer pump would seldom be required to pump against a pressure differential in excess of 25 lbs. This pump is amply powered with a 5 HP motor for delivering 100 GPM against this pressure. However, when it becomes necessary to develop two to three times this pressure, use a larger motor.

Also, the need for raising the differential to 60 lbs. or more merely to be able to fill an occasional single cylinder means that the pump must then handle its entire capacity to this pressure, with perhaps 10 GPM going into the cylinder and the other 90 GPM being by-passed.

It also becomes apparent that this pump must be operated not only against this higher pressure, but for a period 10 times as long per gallon of used output as it would in transfer service.

In such cases where it is possible, we advise that the customer use his transfer pump solely for the large capacity low pressure service, and that a separate small capacity pump be installed capable of handling a limited output to the necessary high differentials for bottling. This system also makes it possible to serve bottle customers at the same time the transfer pump is in operation.

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A dealer in California writes:

"We have found it very difficult to completely empty our tank truck when delivering into our storage tank. We balance the pressures between the two tanks with a vapor line, and can empty two-thirds of our 1,000 gallon truck tank in about 30 minutes, but it sometimes takes an hour more to finish the job."

On further investigation of this case we found that this operator was using 50 feet of ½ in. hose line for his vapor balance connection. Placing gages on both ends of the line, we found a back differential in excess of 10 lbs. when he started the pumping operation, even though the vapor hose line had been connected for over five minutes prior to this. He was using a 50 GPM pump, and within 20 minutes, the vapor pressure in the storage tank into which he was pumping had risen to nearly 60 lbs. in excess of that shown in his tank truck. Obviously from that point on pumping would be slow.

Here is a case of intended pressure balance which actually proved of no value because the connection was definitely inadequate. We did not investigate whether the ½ in. hose was completely closed by a defective lining, as well it might have been, but did find that the substitution of a shorter hose of 1 in. size quickly cured the trouble. We wish to here inject the suggestion that it is very important that pressure balance lines be of ample capacity because in effecting a balance, the differential pressures involved are so low that the transfer of the necessary volume of gas is not as rapid as might be desired or expected.

We also wish to recommend the more frequent use of test gages to make positive determination in cases like the above, as well as in almost every other troublesome analysis involving pressures.