
double suction centr.pumps

Posted by Water - 2008/07/10 09:08

this is an existing application. Four double suction centrifugal pumps most of the time the operators run three in parallel in order to provide enough pressure in the system for a certain demand. According to the pump manufacturer's curve they should be pumping the same flow at the same pressure easily with only two pumps running. The question is why. According to some documentation made available to me two of the four pumps were refurbished two years ago, impellers replaced claiming damage caused by cavitation.

The pumps are fed off of a 36 suction pipe, plenty of NPSH available. Three of the four pumps have inadequate suction piping or at least appeared to be. Flow branches off of a 36"x16" Tee; goes through 16" valve, followed immediately with 16"x12" ecc. reducer and 12"x 10" concentric reducer connected to the pump flange. Flow is between 1,500 and 2,300 gpm per pump (if divided by three (total flow 4,500 to 6,000 gpm. I am suppose to recommend the improvements to the system so they should utilize two instead of three pumps. Is it possible that all this happens due to cavitation cause bu assumed imbalanced flow on double suction pump. Would the flex vane or similar thing help? Coul final concentric reducer have an impact? I would appreciate any comments.

Re:double suction centr.pumps

Posted by Norvicute - 2008/07/13 00:02

Hi Water,

Quote "most of the time the operators run three in parallel in order to provide enough pressure in the system for a certain demand

Please clarify, are you just increasing the normal/rated flow or you will use the same pumps to supply other facility in a certain demand or condition if it so your TDH will increase hence you will not meet enough pressure.

Quote "According to the pump manufacturer's curve they should be pumping the same flow at the same pressure easily with only two pumps running. The question is why. According to some documentation made available to me two of the four pumps were refurbished two years ago, impellers replaced claiming damage caused by cavitation."

This is confusing on the design, if two pumps can. why you have 4 pumps in parallel?

Quote "The pumps are fed off of a 36 suction pipe, plenty of NPSH available"

Mostly the NPSHr given by the pump manufacturer are only intended at rated flow (for a one pump only). Please check the NPSHr at end of the curve for a 4 pumps in parallel.

Lowering the number of pumps is a remedy two pumps one standby will be fine plus proper piping system for a parallel pump configuration.

Please reconfirm your duty condition first(i.e. flow, head, suction pres., etc.) and check pump capability vs these. Then we can go for proper piping system.

gud luck.. give me update.

;) ;)

Re:double suction centr.pumps

Posted by Water - 2008/07/14 09:20

Maybe I wasn't clear enough. What I am trying to figure out is why the pumps are currently pumping way below their design points? Fourth pump should be a spare pump. Three pumps were originally designed for much higher demand than today. The current demand should be easily handled by two pumps, unfortunately the operator is forced to run three pumps in order to maintain the required pressure in the system. So basically the pump curves look like as if the impellers are trimmed to a smaller diameter. New impellers are installed about two years ago, but the flow/pressure characteristics appear to remain the same.

Re:double suction centr.pumps

Posted by Norvicute - 2008/07/14 17:22

:) Hi,

Yes you should check the correct impeller trim required. If problem is same. You may check the following:

- a. Check the impeller wear rings and impeller setting, it may be worn out or the impeller is not properly set.
- b. You may also check the flow meter and the check valve if still ok.
- c. Check the driver as well. I mean the rotation if correct, motor speed if you are using VFD, voltage condition also.
- d. Check the suction pipes etc., there maybe a leak or damage, check air or gas introduction in suction and in stuffing box as well.

You may also check your system head (actual TDH). Review all losses.

Worst is check the pump capability to a parallel operation.

Hope this helps.

give me update.

Otherwise you can provide me a copy of pump curve size and motor rating for me to evaluate the pump.

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Re:double suction centr.pumps

Posted by Water - 2008/07/24 02:11

Thanks for your response. My problem unfortunately is to figure out why the pumps are pumping LESS than they should. Each pump is putting out half gpm as they should based on their certified curves. I know that two of them have been completely rehabed, with visible signs of cavitation. The question is why cavitation occurs and what to do to prevent. Again NPSH required is 23 feet. The pressure gauge at the suction manifold shows 1.5 psi. My main concern is inadequate length of a straight suction pipe. From a common suction header there is only 52" to pump's suction. That includes 36"x16" "T", 16" valve and 16"x12" and 12" x10" eccentric reducers.

the flow to each pump is between 1,500 and 2,500 gpm.

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Re:double suction centr.pumps

Posted by Norvicute - 2008/07/24 03:25

B) ,

first why is cavitation occurs?

Main is you have inadequate NPSH available. It seems that the NPSH require of 23 feet is quite high. Please recalculate your NPSH available.

For the suction pipes and "T" and elbows.

How far is your "T" from the suction of the pump?

Please note that elbows and "T" at pump suction can cause trouble specially on double suction pumps. It must be at least 2D away from your eccentric reducer. A straight run of pipe will do. This will eliminate noise and untsatisfactory operation.

It seems theres a lot of jobs. Just I said first you must calculate your NPSH available. then we can go on the next stage. If your having problem in the computation let me know.

Regards B)

Re:double suction centr.pumps

Posted by Water - 2008/07/24 04:18

Thanks again. Maybe I got this wrong, but just by measuring preesure on the suction header (which is 36") of 1.5 psi, right before it branches off to the pumps' suction side, that means that the available NPSH at that point (neglect vapor pressure) would be $1.5 + 14.3 - VP$, little bit over 15 psi or 35 feet. I will loose some of it from 36" reducing to pumps' suction but that is maximum 4-5 feet. That still leaves me with at minimum 30 feet available NPSH. or 1.3 NPSHr. I think from that, theoretical side I should be OK, unless something weird is going on.

Thanks again

Re:double suction centr.pumps

Posted by Water - 2008/07/24 05:08

Thanks again,

I thought that I answered but I must have pressed wrong button, in any case:

The pressure gauge on suction manifold shows 1.5 psi. Unless I am missing something that should read as at least $14.3 + 1.5 - VP =$ more than 15 psi or around 35 feet of NPSHa. Now I have say about 5 feet of headloss through eaach pump suction, but it should still be around 30 feet or at least 130% of the NPSHr.

It seems to me that the whole problem is in flow pattern to a double suction pump. Unfortunately I don't have a chance to check that out? I am thinking of installing Vane Flex or something similar, but how would I know if that will help?

Thanks again

Re:double suction centr.pumps

Posted by Norvicute - 2008/07/25 01:17

B) ,

Are you sure you are having a reading of 1.5 psi from a pressure gauge?

Okey lets not go on to details on NPSHa. But I guess your missing something on a NPSHr. NPSHr is given by pump manufacturer based on thier impeller and casing design. Please confirm the NPSHr from the manufacturer.

Please give me TDH and rated capacity, or if you want give me the pump model, brand and size.

And I will check at my side as well.

B)

Re:double suction centr.pumps

Posted by Water - 2008/07/25 01:27

Thanks for your effort. NPSHr is listed as 23 feet at the design point which is 2,500 gpm @ 275 feet. I have the NPSHr curve infront of me. The pumps are Ing.Dresser (now Flowserve)Type 6 LR-18 double suction impeller type, running at 1770 rpm. pump has a 10" suction with a 6" discharge.

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Re:double suction centr.pumps

Posted by jc - 2008/09/23 13:38

assuming all four pumps are rebuilt to oem specs w/identical trim impellers, & running at the same speed; i would guess (since very little information is given) that you have two issues - the suction piping is not to HI recommendations - causing flow & NPSHa issues in this side, and you have little knowledge of what the system head curve is - which is imperative to determine where the pumps should be running on their curves. i suggest you find someone with some experience to assist you.

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Re:double suction centr.pumps

Posted by Water - 2008/09/23 14:09

Hi,
Thanks for your input. I do have plenty of experience in designing pumping systems (over 20 years of sucesfully designed and implemented projects. I was hoping that this forum would provide a stimulative discussion on various topics especially pump systems troubleshooting, design and similar challenging applications. An advice: go find someone with some experience does not fit those expectations.

Anyhow, this is an interesting application, I thought I explained it in a lot of details, I have a pretty good idea what caused pumps to failed, but was trying to get some feedback from the peers that may have some different ideas.

Thanks again to all who made that effort.

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Re:double suction centr.pumps

Posted by Norvicute - 2008/09/24 08:01

hey water im sorry for not coming back to..

just we have some problems at site and some huge projects going on..

i will reply to you later.. B)

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Re:double suction centr.pumps

Posted by Norvicute - 2008/09/25 08:13

hey water by the way where is your location?

please attach copy of the pump curve here.

thnx

B) :silly: :woohoo: :side:

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qimpvhzd

Posted by qimpvhzd - 2008/10/25 15:49

qvhkaseu gfmuzapr svpxvblf <http://gpnvcyim.com> upjpwxeq byggqgyn

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pfbkhrap

Posted by pfbkhrap - 2008/11/03 17:51

zdkqehnf wqehzelf <http://sudlxqha.com> pettriyw plszfvkk sihjasil

Re:double suction centr.pumps

Posted by Paul Maier - 2008/11/11 07:33

1st step is do a field test to compare pump field performance of each pump to the manufacturer's curve. Simply because a pump has been refurbished/rebuilt doesn't mean that performance would automatically return to original specifications, (just like a car there are good engine rebuilds and not so good rebuilds).

Run each pump individually and measure Flow, Discharge psi, Suction psi, rpm, and kW (if available) for 5 points on each pump. Plot the field data and compare to manufacturer's pump curve. I suspect you will find performnace significantly below manufacturers specs. If you can measure field kW you will be able to calculate pump efficiency for each of the 5 test points as well.

Then I suggest you read the article in the November 2008 issue of P&S entitled "Pump Refurbishment & Coaitngs"

Good Luck

Re:double suction centr.pumps

Posted by Water - 2008/11/11 08:26

Thanks

Did the flow testing. Unfortunately could not measure individual flow for each pump, rather each combination of three pumps. I may not be clear all along but I do know that the pumps are performing well bellow their designed curve. What I am trying to figure out is why?

Thanks for your interest again
