Willard Says……

On the Importance of a Bypass Valve

BC (Before CONVAC)

Let's spend some time looking over the operator's shoulder as he runs your dredge, which is equipped with a digger on the suction inlet and a vacuum gauge.

The dredge is running and the operator lowers the suction inlet to put the cutter in contact with the bank of solids. The vacuum increases as solids start flowing through the dredge system. He continues to lower the suction inlet in small increments and the vacuum steadily increases to 19 inches, which is where he says he likes to keep it.

He knows that the slurry flowing through a dredge system is a mixture of solids and water and that the ratio of the two components is critical. Too much water means low production and too many solids will cause the pump to cavitate and perhaps plug the discharge pipe. He has learned from experience that if he keeps the vacuum at about 19 inches the ratio of ingredients in his slurry make up a satisfactory mixture. Satisfactory, not because production is satisfactory, but because it is about the best he can do.

Now we see that the vacuum does not stay at 19 inches very long and he has to move the suction inlet to restore that reading.

Again the vacuum coasts down to 16 inches before he again moves the ladder and the vacuum increases to 20 inches. It holds there for a short time and then creeps back down to 16 inches when he again moves the ladder. It is apparent that the target vacuum of 19 inches is elusive.

> Suddenly we are afforded the opportunity to experience what happens when the slurry recipe goes bad.

This time when he lowers the ladder the vacuum increases to 22 inches, holds there for a few moments and then suddenly spikes upward to 25 inches. Immediately, the dredge pump starts making a loud rumbling sound and the whole dredge starts vibrating rather violently. The operator snatches the hoist lever and raises the ladder as fast as he can. Soon the noise and vibration stops and we see the vacuum fall to 8 inches.

He explains that a cave-in covered the suction inlet and restricted the flow of water to the pump so that it choked off—it starved for water. The only way he can correct the problem is to quickly raise the suction inlet out of the choking mass of material and restore normal flow to the pump. Having done that, he pumps clear water for a minute or so to assure that any potential plugging "slug" is flushed out of the discharge pipe.

> This incident was a demonstration of pump cavitation, which happens whenever a pump cannot take in enough slurry to maintain normal flow in the discharge pipeline. The pump cannot discharge what it cannot take in so it throws a fit and we call it cavitation.

Now, satisfied that the discharge pipe will not plug, the operator resumes his endless quest for 19 inches of vacuum, however, as is usual, it takes two or three minutes for him to restore normal operation. The operator says it always takes some time to get back into the material—get the vacuum back up—after the ladder is raised out of the solids bank to stop pump cavitation. You ask how often that happens and he says, "Probably every 10 or 15 minutes, sometimes more often".

> I have just devoted over a page to describing just a snippet of an operator's normal day as he runs a dredge that lacks a bypass valve.
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> I have witnessed this procedure hundreds of times and I have never earned my living as a dredge operator.
>
> It does not have to be that way.

AC (After CONVAC)

Let us look in on the operator of this same dredge after a CONVAC system is installed.

> This paper explores only one attribute—probably the most significant—of any bypass valve system: the ability to mostly eliminate wide fluctuations in vacuum. Most bypass valves have several other features to further improve dredge operation. See willardsays…Review…the CONVAC bypass valve system.

After reading the instructions, the operator enters several initial settings on the CONVAC system touchscreen including a vacuum setpoint of 19 inches. He then lowers the ladder in the normal fashion and vacuum increases when the ladder reaches digging depth. Force of habit causes him to stop lowering the ladder as the vacuum approaches the desired 19 inches. When he lowers the ladder

a little too far he sees the indicated vacuum momentarily go to 21 inches. As the vacuum rises he sees CONVAC go into action. The position indicator shows the bypass valve to be opening and the vacuum quickly falls to the setpoint value—19 inches.

Then he watches as the valve modulates—opening and closing slightly—as it slowly works it trends toward the closed position. All the while the vacuum reading stays at 19 inches until the valve closes. A few moments after the valve closes the vacuum starts to fall just as it did before the valve was installed.

> What happened? This was a demonstration of what CONVAC does best—maintain vacuum at a setpoint: the valve opened only to the extent necessary to keep the vacuum from rising above 19 inches. When there were no longer enough solids available at the suction inlet to create that vacuum, the valve closed, its function concluded and it could no longer contribute to support full production.

Now the operator is given new operating instructions that will make his job much easier and more productive. He is told that from now he is to keep the suction inlet immersed in the solids bank so that the bypass valve constantly modulates to maintain the setpoint vacuum reading.

No longer does the operator have to be concerned about high vacuum—CONVAC does that. No longer does he have to remain alert and instantly react to prevent cavitation—CONVAC does that. No longer does he have to be concerned about maintaining the desired rate of production—CONVAC does that.

Now he has only one job—keep the suction inlet immersed in the material bank so that the dredge system always has an ample supply of solids available to it. CONVAC assures that just the right amount of water is allowed to enter the dredge system through either the suction inlet or the bypass valve to maintain the vacuum at 19 inches. The rate of production can be changed manually by adjusting the vacuum setpoint with a tap of the finger. Or he can let CONVAC adjust the vacuum automatically as required to maintain the desired rate of production.

Keep in mind that the operator's chief function is to keep the suction inlet immersed in the bank of solids. The operator notes that the best production is obtained when the suction inlet is covered with material and the bypass valve is moving as required to control the vacuum.

IGNORANCE DOES NOT PAY;
BUT YOU CAN PAY FOR IGNORANCE

The procedure just described runs counter to the claims and beliefs of most bypass valve purveyors, dredge experts and dredgers. These totally misguided folks stoutly cling to the notion that whenever a bypass valve opens, even a little, production is reduced.

Such ignorance deprives these doubters of the increased profits that CONVAC users have been enjoying for years.

Operators quickly grasp the new concept. They can say goodbye to the endless maneuvering and the boring repetition of actions. No longer do they have to continually maneuver the ladder to maintain a vacuum reading—they leave the suction inlet in the material and let CONVAC maintain vacuum. CONVAC will regulate and control dredge production precisely and automatically ***as long as there is a supply of excess pumpable solids available at the suction inlet***.

CAVE-INS

In event of a cave-in CONVAC users DO NOTHING! CONVAC automatically prevents interruptions caused by cave-ins and relieves cavitation almost instantly. If the cave-in is large enough to cause the digger to stall the ladder should be raised only enough to free the digger and not high enough to come free of the solids.

CONVAC Makes Good Things Happen

- CONVAC enables substantial increases in production and the precise control of vacuum make it possible to increase production to rates that are impossible using manual control.

- CONVAC makes it possible to maximize the productive capability of your dredge without fear of pipeline plugging.

- CONVAC regulates and controls the flow of slurry to the process plant, which maximizes the yield of specification products from the feed stock. This is especially true when feeding classifier tanks.

- CONVAC increases efficiency and reduces wear by enabling velocity control.

- CONVAC reduces the amount of energy used to produce a ton of product.

- CONVAC reduces operator fatigue and increases operator output.

Other Bypass Systems?

Are there other bypass valve systems? Yes, however, they are all little more than enhanced copycat versions of the bypass valve concept that was first developed eighty years ago by Mr. Hofer. Touchscreen displays, klutzy electronic controls and exaggerated performance claims can not overcome the shortcomings mandated by the use of undersized, mis-located butterfly valves accompanied by a generous dollop of ignorance of how such a system should function.

Other systems:

- Lack an intuitive response capability.
- Are not designed to modulate constantly.
- Lack the capability to achieve and maintain full capacity production without interruption.
- Are not supported by knowledge and experience gathered in 30 years spent observing and solving dredge-operating problems.
- Lack one-call customer support.
- Lack overnight parts availability.
- Lack a purpose-dedicated water inlet valve.

CONVAC features the new Linear Needle Valve (LNV) that was specifically designed for use as a dredge suction bypass valve. It is purpose-dedicated. The LNV enables precise control of the bypass flow, longer wear life and simplified repair.

Twinkle Co's CONVAC S^4 suction side stability system is without question the best bypass valve system available. Treat yourself to lower production costs, higher production rates and more profits by installing a CONVAC system on your dredge.

Contact willard@willardsays.com with questions, comment or criticism.