

CONVAC Frequently Asked Questions

1. What is CONVAC?

CONVAC is a modulating suction bypass valve system for hydraulic dredges. It consists of mechanical components, sensors and a programmable operating system that enables the dredge operator to achieve and maintain production rates that are otherwise not possible.

2. What does the word CONVAC stand for?

CONVAC stands for CONtrolled VACuum.

3. What do you mean by “controlled vacuum?”

That is what the CONVAC system does—control vacuum. CONVAC maintains the operating vacuum at the operator-selected setting *as long as there are excess pumpable solids available at the suction inlet.*

4. What does modulating mean?

Modulating means “to adjust or to keep in proper proportion.” That is what CONVAC does. It continually adjusts the amount of water that is allowed to enter the dredge suction pipe to combine with solids and make up a mixture containing the desired proportions of water and solids.

5. Who needs a CONVAC system on their dredge?

Anyone who wants any of the following:

- Increased production.
- Relief from choke-off or too high vacuum.
- No more water hammer, hydraulic ram or pump cavitation.
- Uniform, uninterrupted flow to a sand classifier.
- Freedom from a plugged discharge pipeline.
- Ladderpump dredge production as was promised.
- Less operator stress.

6. How is CONVAC different from the other suction relief or bypass valves?

CONVAC is a modulating bypass valve system that is designed to function full time to maintain a desired rate of production. It is an **operating** system.

Competing suction valves systems are emergency response systems. Assuming that they are properly installed, they may provide relief from problems caused by high or low vacuum, high or low discharge pressure or perhaps, low velocity. These valves respond to solve a problem by opening a water inlet valve in the suction pipe. Nearly always, this response results in a decrease in production.

Because the CONVAC system bypass valve is already partially open during normal operation, it is constantly in the process of preventing problems that might interrupt normal dredge operation. CONVAC prevents problems that emergency-response bypass valves belatedly react to solve after they occur.

CONVAC does everything competing valve systems do, all the while maintaining uninterrupted, full production.

7. CONVAC seems expensive. How will I get my money back?

Several ways:

1. Substantially increased production. CONVAC users report production increases of 20 percent or more.

One producer found that it always required 14 days of operation to fill his empty stockpile area after he started up in the spring. Last winter he installed the CONVAC system on his ladderpump dredge. After startup, his stockpile area was full after only 8 days of operation. This dredge owner stated that previous to this experience he had only one possession that was not for sale—his wife. Now there were two possessions that he would not part with—his wife and his CONVAC system.

2. Increased sand-classifying tank efficiency. CONVAC users report that they get a notable increase in the yield of specification sand from their pits. This is because the efficiency of classifying tanks is dependent on a uniform, uninterrupted inlet flow of water and sand.
3. Happier dredge operators. CONVAC enables operators to be more productive with less effort. Stress is reduced because they do not have to be on full alert in anticipation of cave-ins or other interruptions. They no longer have to worry about pipeline plugging. CONVAC automatically takes care of most stress-causing interruptions.

4. Reduced wear cost. Pump and discharge pipeline wear cost per ton decreases as the slurry density increases and the velocity decreases.
5. Reduced energy cost. It requires less horsepower per ton to pump a high-density slurry at a uniform, efficient velocity.

8. What do I get when I order a CONVAC system?

The CONVAC system has two significant components in addition to pressure sensors, wiring, and a dedicated hydraulic system:

1. A hydraulically operated slide valve that allows a controlled amount of water to enter the dredge suction pipe at a point near the suction pipe inlet.
2. An electronic display/control unit mounted on the operator's console. A keypad and three large, bright red, LED displays are mounted in the cover of display/control unit. The displays show velocity, vacuum and bypass slide valve position.

9. How does the operator use CONVAC after it is installed and ready to go to work?

He enters the low velocity setpoint using the keypad. This entry programs the CONVAC to guard against pipeline plugging.

Next, the operator uses the keypad to enter a vacuum setpoint. As long as excess pumpable solids are available at the suction inlet, CONVAC will automatically admit water into the suction pipe at the rate required to maintain the vacuum at the set point value.

Then the operator's maneuvers the dredge to keep excess pumpable solids continuously available at the suction inlet and occasionally adjusts the vacuum setpoint.

10. How does the operator know that there are excess solids available at the suction inlet?

When the valve position indicator shows that the valve is partially open. The valve will trend toward closing as the amount of excess solids at the suction inlet decreases. The operator should crowd into the material to keep the valve partially open—modulating—at all times. If the valve goes shut, that is an indication that there are not enough solids available at the suction inlet to support a full rate of production.

11. Why would the operator adjust the vacuum? Why not just set the vacuum and leave it at that setting?

Because vacuum is not an accurate indicator of production. The vacuum gauge reading varies to indicate changes in:

- Velocity
- Density
- Restriction at the suction inlet
- Digging depth.

The effect that each of these variables is having on the vacuum reading at any one time cannot be determined.

Constant vacuum does not equal constant production.

12. How does the operator know when and how much to adjust the vacuum setpoint?

Before we answer that question, let us provide some explanation of the theory we use to make the CONVAC system so effective in increasing dredge production.

We use a principle, which states that:

“Constant pipeline velocity at a constant pump speed results in a constant rate of solids production.”

13. What is so great about this “principle?”

Using this principle, the CONVAC-equipped dredge operator can maximize dredge production and efficiency or he can regulate dredge production to feed a process plant to capacity without overloading it.

Cave-ins or choke-off condition no longer interrupt pumping. Cave-ins no longer choke-off, they bring pumpable solids that CONVAC requires be present at the suction inlet to maintain the desired rate of production.

14. CONVAC controls vacuum and this “principle” says nothing about vacuum. How do we get from vacuum to velocity?

By adjusting vacuum as necessary to maintain a steady velocity.

15. How does adjusting the vacuum control the velocity?

The goal is to maintain a constant velocity at a constant pump speed. Select a velocity that you wish to maintain, say 14 feet per second (fps). If the velocity is faster than 14 fps, increase the vacuum setting to take in solids at a greater rate. The velocity will slow as the load of solids in the system increases.

If the velocity slows to a rate below 14 fps, decrease the vacuum setting to take in solids at a slightly lower rate or enough to cause the velocity to slowly increase.

Experience will tell the operator how much to increase or decrease the vacuum to keep the velocity constant. The CONVAC system touch pad enables the vacuum to be adjusted in one tenth of an inch of vacuum increments. With a little practice, adjustment may be required only every few minutes.

16. How is the rate of production regulated?

By adjusting the pump speed. Maintain the same velocity by adjusting the vacuum and increase the pump speed to increase production. If, for whatever reason, production is too high, decrease the pump speed.

Now you know how to benefit by using the principle, **“Constant pipeline velocity at a constant pump speed results in a constant rate of solids production.”** CONVAC makes it possible!

Remember, this procedure assumes that the operator maintains a supply of excess pumpable solids at the suction inlet at all times.

17. Can I use this principle even if I do not have a CONVAC system?

Yes, you should be able to prove the validity of this principle on your dredge and use it to increase production without a CONVAC system. Set the dredge pump speed and try to maintain a constant velocity by adjusting the vacuum. Increase the vacuum slightly when velocity increases above the target velocity and decrease the vacuum slightly when the velocity slows to less than the target velocity. If you can maintain a constant velocity at a constant pump speed you will observe a nearly constant rate of production.

Even if you are blessed with an extremely free-flowing deposit and vacuum is easy to adjust, it will require constant effort by the operator to maintain a constant velocity.

The CONVAC system automates this procedure. CONVAC reacts instantly, does not get tired or inattentive, solves problems caused by cave-ins and assures a higher rate of uninterrupted production than even the best, most attentive operator can hope to achieve.

18. What is the best velocity to maintain?

The best, most efficient, recommended velocity is a rate of flow that is slightly faster than the critical velocity. The critical velocity is the rate of flow that is just fast enough to keep solids from settling to the bottom of the discharge pipe. The critical velocity will vary with pipe size, density and gradation of the particles in the slurry.

19. How do I find out what the critical velocity is for my dredge system?

Experience and experiment. As a rule of thumb, the best pumping velocity in 8 to 14-inch discharge pipelines pumping a slurry with a density of 20 to 25 percent solids by weight would be about 14 feet per second.

An operating velocity of 17 feet per second is widely used to calculate the flow from a dredge, however, this is too fast for densities of 20 to 25 percent solids by weight. It is more appropriate for very coarse particles or a density of 30 percent or higher.

For more information on velocity see the Velocity Meter section.

20. Won't maintaining excess solids at the suction inlet cause pump cavitation or choke off?

No. The CONVAC system prevents pump cavitation or choke off by continuously admitting enough water into the suction pipe to keep the vacuum from exceeding the vacuum setpoint that the operator has selected.

21. Will allowing water to enter the suction pipe dilute the slurry and reduce production?

Yes and no.

Yes, allowing water to enter the suction pipe does dilute the slurry. If a certain amount of water is not allowed to enter the suction pipe, high vacuum or choke off will occur because the density of the mixture in the suction pipe is too high—it needs to be diluted.

As long as excess pumpable solids are available at the suction inlet CONVAC admits only enough water to maintain the selected vacuum with the result that a mixture having the desired ratio of water to solids is allowed to enter the dredge pump.

No, production is not reduced. Full, controlled production continues even when the suction inlet is in a choke-off condition.

22. What happens if the velocity is too low?

The discharge pipeline may form a sliding bed of solids on the bottom of the pipe. At a slightly lower velocity, a stationary bed of solids will form on the bottom of the pipe. At a still slower velocity the pipeline is likely to plug completely.

23. How does the CONVAC system prevent discharge pipeline plugging?

The operator selects a low velocity setpoint using the CONVAC input keypad. Whenever, for whatever reason, the velocity falls below the setpoint rate, the CONVAC bypass valve opens fully to assure the entry of water into the dredge system to prevent pipeline plugging.

As soon as the velocity increases to a rate faster than the low velocity setpoint, CONVAC resumes normal operation.

24. If the CONVAC bypass valve is wide open, won't that reduce production?

Yes, but nowhere near as much as would a plugged pipeline. Reduced production caused by a wide-open CONVAC bypass valve is very short term. As soon as the velocity increases to a rate that is faster than the low velocity setpoint, the CONVAC system resumes normal operation. This is an emergency feature that will seldom be used if CONVAC is utilized correctly.

25. How reliable is the CONVAC system?

Very reliable. The system has a one-year warranty. Modular construction makes it easy to change out any component that fails. We stock all components. The oldest system is over eight years old and still making its owner richer and happy.

26. Can I talk to a CONVAC user?

Yes. Over 75 CONVAC installations confirm the remarkable effectiveness of this system. Several repeat customers populate our owner's list. We will be happy to furnish references. A lot of CONVAC owners like to brag about the wisdom of the decision they made when they decided to buy a CONVAC system for their dredge.

27. What operating conditions have to be present in order to benefit from using the CONVAC system?

The operator must be able to maneuver the dredge to keep excess pumpable solids constantly available at the suction pipe inlet. In other words, there must be more pumpable solids available at the suction inlet than are needed to satisfy production requirements. This means that the dredge should have a cutterhead or chain ladder digger and the appropriate equipment needed to maneuver the suction inlet to keep it in contact with the solids bank.

28. *If I used some imagination, what would I see in my operation after I install a CONVAC system?*

IMAGINE how your dredge production would increase if the operator did not have to constantly raise the suction inlet each time there was a cave-in.

IMAGINE how much more productive your operators could be if they did not have to be constantly on the alert to prevent pump cavitation due to suction choke-off.

IMAGINE how it would be to not have to worry about pipeline plugging.

IMAGINE the increase in process plant efficiency—the increase in spec product yield that will result—when it is fed a uniform, constant flow of slurry.