

THE TWINKLE CO

CONVAC

MODULATING BYPASS VALVE SYSTEM

A
MODERN,
FULLY AUTOMATIC,
SUCTION RELIEVING BYPASS VALVE
FOR SUCTION DREDGES.

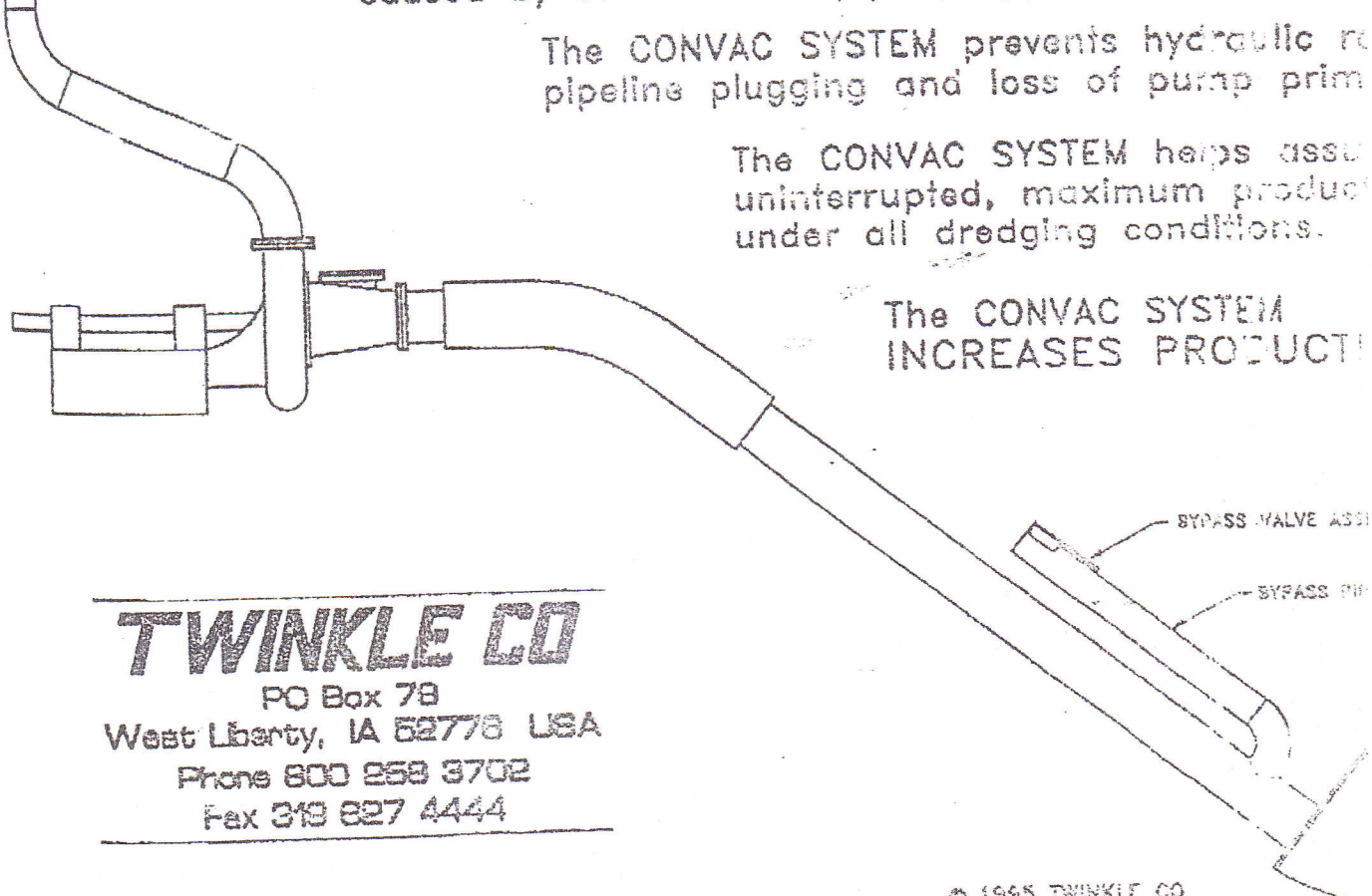
The CONVAC SYSTEM maintains vacuum at a selected setpoint as long as excess solids are available at the suction inlet.

The CONVAC SYSTEM prevents dredge pump cavitation caused by suction inlet pipe plugging.

The CONVAC SYSTEM prevents hydraulic ram pipeline plugging and loss of pump prime.

The CONVAC SYSTEM helps assure uninterrupted, maximum production under all dredging conditions.

The CONVAC SYSTEM
INCREASES PRODUCTION



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THE CONVAC SYSTEM

The Twinkle Co CONVAC modulating bypass valve system enables the operator to maintain uninterrupted capacity production despite cave-ins or choke-offs. The CONVAC system comprises the following components:

THE BYPASS PIPE ASSEMBLY

The customer-supplied bypass pipe assembly is a section of steel pipe, usually the same size as the suction pipe, with a 90 degree elbow on one end and capped on the other end. The elbow end of the bypass pipe tees into the suction pipe near the suction inlet. It must extend up the ladder to the point where the capped end will not be covered by cave-in solids.

THE BYPASS VALVE ASSEMBLY

The bypass valve assembly is installed near the capped end of the bypass pipe. The internal position indicator creates an electronic signal so that the valve position is instantly displayed on the operator's console. The actuator is all stainless steel and the slide assembly is mounted in long-wearing polymer material.

THE HYDRAULIC PACKAGE

The hydraulic package is independent of any other hydraulic systems which may be on the dredge. It includes a hydraulic pump, reservoir, control valve, filter, hydraulic hoses and adapters and pressure gauge. The 1/2" standard Schedule 40 black pipe is to be furnished by the customer. The hydraulic pump, requiring about 3 horsepower, can be driven by the diesel engine or by an electric motor.

THE OPERATOR/CONTROL ENCLOSURE

The operator/control enclosure mounts on the operator's console. It contains solid state electronic system controls and has the bargraph meters and operator's controls mounted on the cover. The bargraph indicators show vacuum, pipeline velocity and bypass valve position. Operator controls include the vacuum setpoint knob, low velocity setpoint control and emergency opening and power switches.

THE VACUUM SENSOR

The vacuum sensor is mounted on a surge pipe which is teed onto the suction pipe as close to the dredge pump suction inlet as possible. The sensor converts the vacuum pressure to an electronic signal. If the dredge has a ladder (underwater) pump, a Twinkle Co Laddervac vacuum gauge system must be installed.

If you have a dredge, we have something you need

THEORY OF OPERATION

Vacuum pressure is the operator's main source of information as to when and what should be done to maintain dredge production. Vacuum is an indicator of the density of the slurry that is flowing up the suction pipe to the pump inlet. When vacuum is held steady, slurry density (specific gravity) usually remains nearly constant in the suction pipe and solids production will be nearly constant. The operator's task is to maneuver the suction inlet so that the vacuum holds steady at the reading he judges to be correct for the conditions that prevail at that time.

Slurry density is determined by the ratio of solids to water in the mixture flowing in the suction pipe. Moving the suction inlet usually changes the ratio by either increasing or decreasing the amount of solids that are taken in. If a higher vacuum is desired, the suction is usually lowered slightly or crowded into the material bank so that more solids are made available at the suction inlet. If the vacuum is too high, the suction inlet is moved away from the solids so that the amount of solids in the mixture is decreased. The operator must constantly monitor instruments and be ready to adjust the vacuum to maintain production. If the operator fails to maintain the desired reading, the system can overload and perhaps plug or unload and produce less than it could have.

The CONVAC system takes over a major part of the operator's task by automatically adjusting the amount of water that enters the suction pipe so that the desired mixture ratio is maintained as long as there are sufficient solids available at the suction inlet.

DREDGE OPERATION USING CONVAC

Normal dredge operation calls for the operator to prime the dredge pump and lower the suction inlet to contact the bank of solids. As solids enter the suction pipe, the vacuum pressure rises above the clear water reading and continues to rise to the desired reading. The operator then commences to move the suction inlet as required in an effort to keep the vacuum at the desired value.

Dredge operation with CONVAC starts out the same as normal, however, as the vacuum rises the operator sets the CONVAC vacuum selector knob at the maximum vacuum he wishes to maintain. The suction inlet is crowded into the solids bank so that the maximum vacuum setting is reached and the bypass valve opens to prevent the vacuum from rising higher. The bargraph valve position indicator is highly visible and becomes the operator's primary operating indicator. Continuous production occurs when the bypass valve is opening to meter water into the suction pipe to maintain the slurry density at the desired level. The operator monitors the valve position indicator and maneuvers the suction inlet so that the valve is always partially open which indicates that excess solids are available. CONVAC will add the proper amount of water to keep production constant!

If a cave-in covers the suction inlet, CONVAC opens further to assure that sufficient water is available for pumping to continue uninterrupted. If the cave-in is large enough to stall the digger, the operator picks the suction up enough to free it, but not so high as to clear the material. Cave-ins do not cause interruptions and there is no need to raise the suction to clear the line.

In addition to the vacuum setting, the operator also adjusts the low pipeline velocity setpoint. If the pipeline velocity drops below the setpoint the bypass valve will open and remain open until the velocity rises above the setpoint. This insures that the pipeline will not plug and helps assure uninterrupted production.

The CONVAC system takes the drudgery out of dredge operation by continuously monitoring and maintaining a steady vacuum and doing it better than even the most attentive operator. Steady production can be maintained at maximum capacity with less operator input and without fear of interruption due to cave-ins.

CONVAC will pay for itself by making increased production possible and preventing pipeline plugging. Profit will rise when CONVAC controls the rate of solids intake.

THE CONVAC PACKAGE

The following services and components are included in the CONVAC package:

1. Hydraulic pump (requires approx. 3 horsepower)
2. Hydraulic oil reservoir
3. Hydraulic filter
4. Hydraulic control valve
5. Hydraulic pressure gauge
6. Hydraulic hose and adapter package
7. Bypass valve assembly
8. Hydraulic valve actuator with internal position indicator
9. Operator/Processor Enclosure
10. Installation drawings and instructions
11. After above listed components have been installed by customer, Twinkle Co personnel will complete electrical hook-up, check out system, start-up and provide operating instructions.
12. All wiring and connectors for CONVAC system
13. Power required is 24 volts DC. 120 volt AC to 24 volt DC converter furnished when required.

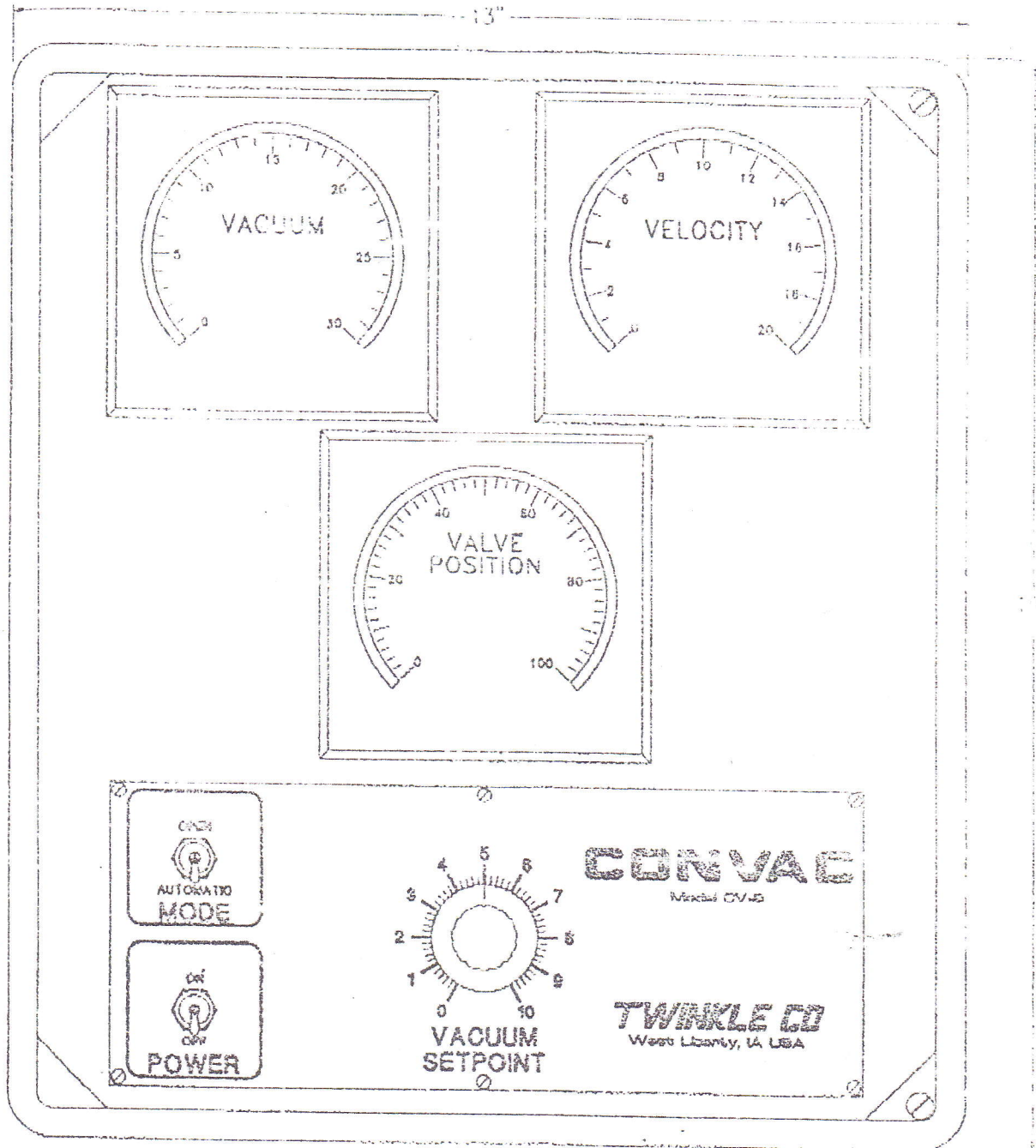
ITEMS TO BE PROVIDED BY CUSTOMER

- A. Bypass pipe and elbow on dredge ladder
The bypass pipe is usually same size as suction pipe.
- B. Underwater pump dredges must be equipped with Twinkle Co Laddervac electronic vacuum gauge system.
- C. Hydraulic oil pipes (1/2", Schedule 40, black)
- D. Hydraulic oil (approximately 10 gallons)
- E. Installation of components number 1 through 10 above. Twinkle Co personnel will complete the electrical hook-up.
- E. V-belt to drive hydraulic pump (diesel dredge only)
- F. Velocity meter
- G. Starter and wiring for hydraulic power pack electric motor (electric dredge only)

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CONVAE

MODULATING BYPASS VALVE SYSTEM

**OPERATOR'S PANEL****TWINKLE CO**

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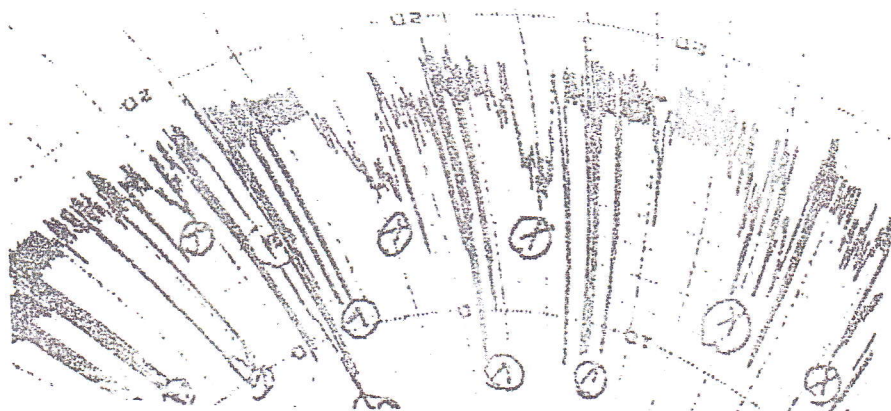
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PROOF OF HOW CONVAC CAN IMPROVE YOUR DREDGE PERFORMANCE.

Each of these vacuum recorder charts tells the story of a dredge's performance.

The operator of this cutterhead dredge has written a chart that is typical in a free caving deposit. He has tried to maintain a vacuum averaging about 16 inches. The high-vacuum spikes show how interruptions forced the operator to react by raising the ladder to decrease vacuum.



This cutterhead dredge is equipped with a Convac modulating bypass valve system. Note the amount of time that vacuum was automatically maintained between 17 and 18 inches of vacuum. Cave-ins did not cause disruptive high-vacuum spikes. The big interruptions (marked X) were caused when this spud-equipped dredge reached the end of its swing and had to step forward.

The downward spikes (marked V) show where the valve automatically opened each time the velocity fell below the operator-selected minimum rate. By dialing in a slightly lower vacuum, the velocity can be maintained just above the low flow set point.

Convac will do this for you!

DIAL IN VACUUM WITH CONVAC!

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If you have a dredge, we have something you need.

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TOPIC #8

THE VELOCITY METER

An ultrasonic velocity meter and a vacuum gauge are the most important instruments on a hydraulic dredge.

The vacuum gauge provides a general indication of the amount of solids entering the dredge system.

The velocity meter provides an accurate indication of how the complete dredge system is functioning.

Troubleshooting, analyzing and operating a dredge system is much easier if the dredge is fitted with a velocity meter. Identifying problems which affect dredge performance usually leads to their solution.

Every dredge system has its limits. The challenge is to identify the limit and operate the dredge to the maximum allowed by the limiting factor. Once identified, the limiting factor may be eliminated and production increased until another limit is met.

Dredge production always increases when a velocity meter is installed and used as an operating tool!

There is **no other** instrument or combination of instruments that will provide the operator with the information needed to maneuver the dredge and maintain production at the desired rate.

HOW A VELOCITY METER WILL SOLVE YOUR DREDGE PROBLEMS

Long Pipeline and Poor Production? Use the velocity meter to load the system to its limit and maintain maximum possible continuously.

Pipeline Plugging? The velocity meter will provide ample warning that plugging is about to occur so that the operator can adjust the feed rate and prevent plugging.

Frequently Pumping Clear Water to Clear the Pipeline? The velocity meter will indicate when the flow rate in the pipeline is becoming too slow. The operator will decrease the vacuum and take in solids at a reduced rate. As the velocity speeds up, the operator increases the vacuum and takes in solids at a faster rate. There is no need to "clean out the line". **EVER**

If you have a dredge, we have something you need.

Want to Know How Fast to Run the Dredge Pump? The velocity meter answers that question for all pumping conditions. Whether pumping heavy or light, long or short pipeline, the velocity meter will indicate how fast the pump should run.

Does the Dredge Overload the Processing Plant? The velocity meter displays the information the operator needs to deliver solids to the process plant at a continuous, controlled rate.

Having Trouble Meeting Sand Specifications with a Classifying Tank? These machines depend upon a uniform flow of water to grade the sand particles. The velocity meter enables the operator to deliver a constant, uniform flow to the classifier.

Surges of Water and Solids Screwing Up Process Plant Operation? The velocity meter will inform the operator as to when and how much to adjust the pump speed so that surges no longer occur. **EVER**

High Wear in the Dredge Pump and Pipeline? By experimenting, the best, lowest, productive velocity for the particular set of conditions can be found. Keeping the velocity constant at the best flow rate minimizes wear.

Too Much or Not Enough Water Going to the Processing Plant? The operator can control the velocity (flow) if the dredge is equipped with a velocity meter.

Breaking In a New Operator? A velocity meter will give the new operator a sensitive, accurate indication of dredge system function. New operators can produce like "pros" with little training.

Is the "Old" Dredge Operator Producing as much as the Machine is Capable of? Probably not if there is no velocity meter on the dredge. There is no other way to gauge dredge performance with the accuracy and timeliness that is possible using the velocity meter.

The Operator Can't see the Discharge Plume or Pumping at Night? The velocity meter will enable the operator to pump productively and continuously to an unseen distant point, day or night.

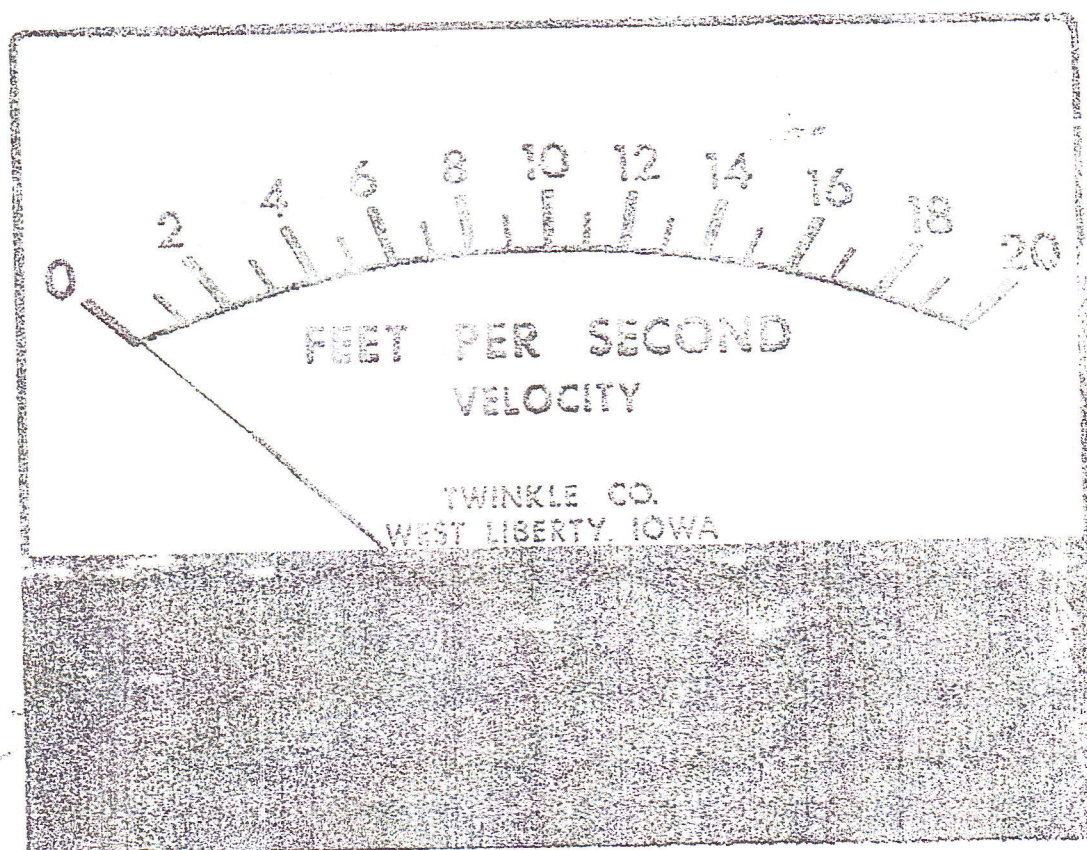
Want to Save Energy? Use a velocity meter to increase slurry density. Quit pumping a lot of extra water.

Is there a Booster Pump in the Line? It is important to keep pressure on the booster pump inlet. If sufficient velocity is maintained at the dredge, the booster inlet pressure will be okay.

A VELOCITY METER PACKAGE

FOR HYDRAULIC DREDGES
from
TWINKLE CO

PANEL METER



The Twinkle Co Velocity Meter Package includes this large, easy-to-read panel meter. The velocity shown on this black-on-white display is the principal indicator of dredge system function.

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