Willard Says……

STIFF-PIPELINE POSITIONING

interferes with; stymies; thwarts; frustrates and otherwise prevents high dredge production. Let me word it a little differently; Stiff-Pipeline Positioning creates more problems than it solves. It is a very poor scheme for positioning a dredge.

The sketch on page 6 shows the typical arrangement of a dredge system with Stiff-Pipeline Positioning. The system utilizes winch-powered right and left swing lines and a rigid discharge pipeline to position the dredge. The pipeline—a rigid arm—holds the dredge out against the solids bank and the swing lines are used to position the dredge on an arc described by the discharge pipeline/radius arm. The pipeline has a flexible connection—usually a short discharge sleeve—at shore to accommodate the swing of the pipeline. Usually, but not always, a short length of discharge sleeve at the rear of the dredge is used to prevent dredge movement from imposing extreme stress on the pipeline.

Let me now recite the many ways Stiff-Pipeline Positioning stymies good production.

Long Advances

The fixed length of the rigid pipeline does indeed hold the dredge out against the solids bank. Forget about backing away from the bank: can't do it. The dredge is advanced into the bank by inserting a section of pipe into the pipeline to make it longer. The pipe section should be about 3 feet long for rotary cutter dredges and 5 feet for linear cutter dredges. But you know how it is; adding short sections means that they have to be added often.

The operator says, "I have an idea…why don't we add 10 feet at a time and then we won't have to do it so often?"

Some time later….

The operator says, "Dammit, we just did this. We have to add these 10-foot pipes every whipstitch; only have to do it half as often if we make 'em 20-feet."

And so 20-foot sections it is. I did not actually hear this conversation, but the gist of it is apparent when operators say that they used to add short sections and now they are adding 20-foot sections to advance the dredge. Apparently, no one noticed that production went down as the length of advance increased. The important thing is; they don't have to add a chunk of pipe every time they turn around.

Inserting a length of pipe into a pipeline is not a trivial task. It is time consuming and physically demanding work that requires at least two men. Often they are expected to make the pipe connections on the water using a tippy, narrow, V-bottom boat. Because it is a job that no one wants to do, it is done as infrequently as possible. Inserting shorter pipes would increase production considerably compared to the problems caused by advancing the dredge 20 feet. A long advance detracts from production as explained below.

Long Advances w/ Rotary Cutters

When Stiff-Pipeline Positioning is used on a rotary cutter dredge, any advance over about three feet will restrict the movement of the rotary cutter. After a too-long advance, the cutter is lowered into the solids and it cuts a slot in the bank as it descends. The gash deepens until the suction pipe/ladder frame comes to rest on a bank of undisturbed solids. That bank of undisturbed solids exists because the dredge was advanced too far; the stiff-pipeline prevents backing up. Dredge production continues as long as the basket can be lowered and remain in contact with an ample supply of pumpable solids. When the ladder "heels off" and is prevented from going down any further, the cutter can no longer contact the solids bank and production tapers off to nothing.

To reestablish production the operator has to maneuver the suction inlet to keep it in contact with pumpable solids. At this point that is easier said than done because he cannot lower the cutter any further. Then he finds that he cannot swing sideways in either direction because the ladder frame is bearing against the side of the gash in the solids bank. The only way the ladder can move sideways is to bull-doze material out of the way—a task for which it is not equipped.

The operator is now in a pickle. The only way he can move the ladder is up and there are no pumpable solids in that direction.

The operator then uses his only option, raise the basket to point where it can be swung sideways and lowered once more. Production resumes for a short time until the suction pipe again comes to rest on solids beneath it.

This lift, swing, lower, lift, swing procedure can go on endlessly. If this scenario seems familiar, try short advances. *Long dredge advances cause low production.*

Long Advances w/ Linear Cutters

Linear cutter (chain ladder) dredges also suffer periods of poor production when the Stiff-Pipeline Positioning system forces long advances. Chain ladders cut slots. The correct procedure is to anchor the dredge and lower the linear cutter into the solids bank at a rate sufficient to maintain the vacuum at the desired level. The cutter is lowered until it reaches the bottom of the deposit.

The length of dredge advance determines how much of the chain traveling along the underside of the digger frame is in contact with undisturbed solids. The slow-moving chain does an excellent job of loosening solids and screening out oversize rocks, however, the only portion of the whole structure and digger mechanism that really counts is the nose end/suction inlet. If the length of the trench or slot that must be dug is too long, the ladder cannot dig its way down fast enough to satisfy production requirements by keeping the suction inlet in contact with sufficient pumpable solids. The effectiveness of the chain is frittered away cutting a long slot.

Too often I have watched an operator maintain a slack ladder hoist line and accept poor production while waiting for the ladder to slowly cut down into the solids bank. The chain moves slowly. It is not an efficient trencher. Running the chain faster will move solids out of the way more quickly, however, the rate of chain wear is directly proportional to chain speed. When a too-long advance forces the chain to move too much material out of the way its downward progress is going to be slow. Long advances cause more chain to be in contact with undisturbed solids which increases the likelihood that it will stall frequently. Maximum production can be sustained only with short advances which concentrate the chain's considerable digging power in a small area near the suction inlet.

Short dredge advances help insure the availability of solids at a rate sufficient to maintain satisfactory production. *Long dredge advances cause low production.*

Cave-ins

Long advances cause large cave-ins. The nature of sand and gravel dredging requires that the suction inlet be maintained at the bottom of the deposit. The goal is to cause cave-ins so that all of the various strata of sand and gravel in the deposit mix as they tumble to the bottom. This mixing action helps to assure that a fairly constant gradation of particle sizes will be delivered to the process plant. Sand and gravel process plants are most efficient when the feed stream is uniform in quantity, density and particle gradation.

Cave-ins are not only desirable, they are necessary for good sand and gravel production. Small cave-ins feed the suction inlet and sustain production.

"Cave-in" is also a dirty term in dredging circles because middle-sized cave-ins "stick" the ladder and cause cold sweats of hopeful anticipation that perhaps it can be pulled free or will dig itself out. Large cave-ins bury ladders and cause very expensive and time-consuming recovery efforts.

When the endloader operator loads out of a 50-foot-high stockpile, he does not keep removing material from one point in the side of the pile. He works against a wide face of material so that each bucketful that is removed undermines the slope above and causes a thin sheet of aggregate to slide down to the ground. Imagine what would happen if he continually followed the same track as he removed material from the side of the pile. He soon would create *a gash* in the side of the pile.

As the gash deepens, the cave-ins that result are likely to become larger because they can now come, not only from the front, but both sides. If the loader operator persists in this procedure, he is likely to be buried by material. The same scenario takes place whenever the dredge is advanced too far into the solids bank. *Long dredge advances cause large cave-ins. Long dredge advances cause low production.*

Cleanup

Some dredge owners impress upon their operators the importance of "cleaning up the deposit." They want to recover as much of the desirable material as they can. This is not such a bad idea except for the fact that sand and gravel dredges are very poor "sweepers." Time spent "cleaning up" is time spent producing poorly. The economic justification is seldom sufficient to try to get every last crumb of good material. Stiff-Pipeline Positioning *automatically* causes an excess amount of solids to be left behind. A 10-foot advance *automatically* leaves a 5 to 6-foot high windrow of undisturbed solids behind. A 20-foot advance *automatically* leaves a 10-foot high windrow of good stuff in the pit. The large cave-ins provoked by long advances flow out behind the dredge (which cannot backup) and add to the quantity of material left behind. Those who use Stiff-Pipeline Positioning should not spend a lot of time worrying about cleaning up the bottom because *long dredge advances automatically leave lots of material behind!*

Timely Pipe Lengthening

Stiff-Pipeline Positioning requires that pipe be installed to advance the dredge as soon as it has completed its swing. After it has removed all of the available material from the trench described by the arc of the rigid pipe, the dredge is out of material. It cannot back up and it cannot go ahead. Time to install a section of pipe.

More than a few times I have visited a dredge that was not producing at anywhere near its capacity and have the operator explain that he was "just cleaning up" while waiting to extend the pipeline. Waiting for help, or a joint of pipe to be prepared, or daylight, or the wind to go down, or the rain to quit. Meanwhile expenses continue and production is lousy. *Long dredge advances cause low production*

The Wind Must Blow

There is a rule that applies to dredge operations that use the Stiff-Pipeline Positioning system. The rule is "The wind is sure to blow when it is time to add pipe". Coupling a pipeline on the water is challenging at best and nearly impossible under windy conditions. Pipe installation cannot be scheduled with precision because the dredge cannot be advanced before it has cleaned up all of the material in the present arc. Maybe it just seems like the wind always comes up when the dredge runs out of material and must be advanced. *Long dredge advances cause low production*

Pipeline Joint Stress

It is fascinating to see the amount of bow a side wind can cause in a several-hundred-foot-long "rigid" pipeline. Such a bow is not a matter of fascination so much as it is a matter of concern to those who have to repair the joints that are overstressed and eventually crack or break under such conditions. Stiff-Pipeline Positioning requires a rigid pipeline with rigid joints. *Fixing pipe joints is called down time.*

Keeping the Dredge "Square"

One comment voiced by those who use Stiff-Pipeline Positioning is that it "keeps the dredge square with the cut." I am not persuaded that keeping a dredge square with the cut or the pipeline or the world or anything else has much to do with production. The concern should be focused on doing whatever it takes to keep the suction inlet in contact with the solids bank so that maximum production can be sustained continuously. Whether the dredge is "cocked" to one side or the other is of little consequence as long as it does not interfere with production. *A "square" dredge does not production make!*

No Plastic Allowed

Stiff-Pipeline Positioning systems require rigid steel pipe which prevents the use of flexible plastic pipe. Many dredge owners have reduced production costs by switching to plastic discharge pipe and everyone should try it. One more opportunity missed by disciples of Stiff-Pipeline positioning.

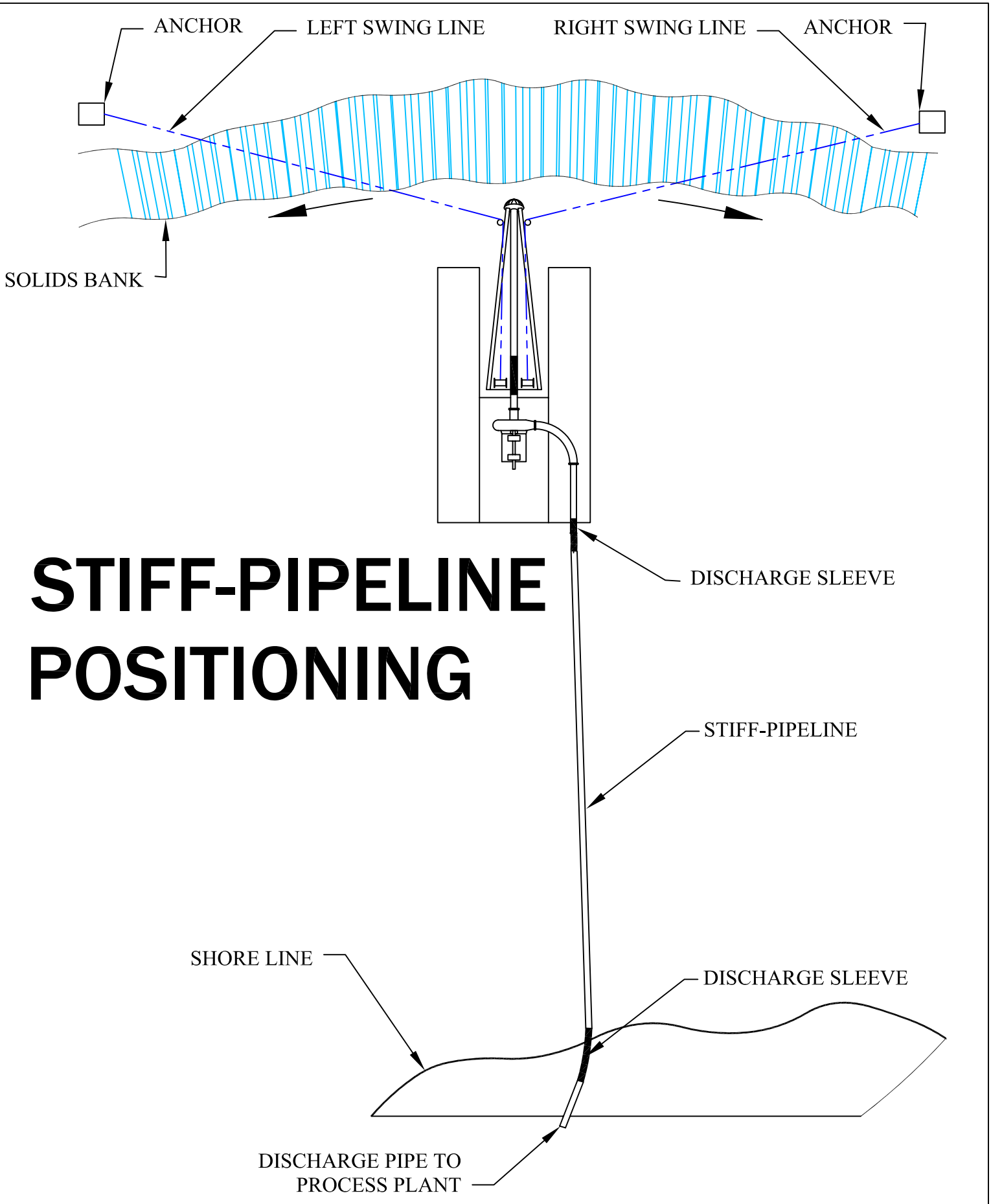
Flexible Pipeline Systems

See *Willard Says……*papers on 3- and 5-wire positioning systems. The advantages that obtain through use of a flexible discharge pipeline are manifold:

- Short advances prevent the problems of keeping the suction inlet immersed in pumpable solids.
- Short advances cause smaller cave-ins.
- Cleanup of the deposit can be done more efficiently when the dredge can be freely maneuvered to mine the solids.
- Adding pipe in 40 to 80-foot segments can be scheduled at a convenient time when the wind rule is not in force.
- Steel pipeline joints cause less problems when relatively short rigid sections of steel line are connected by discharge sleeves.
- The 3 and 5-wire positioning systems keep the dredge suction inlet in contact with the solids bank even when the dredge is not "square with the world."
- Plastic pipe can be used if desired.

3- and 5-wire, flexible discharge pipeline positioning systems are more efficient than Stiff-Pipeline Positioning! The dollar cost for a tail line winch is slight compared to the benefits that will accrue after Stiff-Pipeline Positioning is discarded. The biggest cost is the probably the required change of mindset. Give it a try and you will come to appreciate a flexible pipeline positioning system.

Comment, question, criticism, information on products mentioned? Contact willard@willardsays.com.



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