Tuning Your Gold Sluice

The Fear Factor


Whether you’re a commercial operation running 200 yards an hour or a new prospector running a stream sluice for the very first time, I think you’ll learn something from this message. “The fear of losing gold... usually causes us to lose it.” I think I repeat this one line more than any other when working with both commercial ops and prospectors. Learning how to LOSE the FEAR... and gain control over your sluice will make you an expert very quickly.

While there are a huge amount of variables that go into catching gold in a sluice, I think tuning is the critical factor. I’ve been heard jokingly saying many times, give me a few pieces of wood and some “dog poo”, I’ll make you something that can catch gold. But... it’s the truth. As long as you understand some basic science and learn how to TUNE something... it will probably work. However, precisely tuning for very fine gold can be tricky. Seeing that many of us chase this these tiny specs it makes precise tuning even more important.

A key element that all miners should focus on is the proper “tuning exchange”. Meaning... let the JUNK flow out, or be worked out by exchange zones, and hold the good stuff. (gold) Sounds simple enough until you add in about 15 various factors that will impact your recovery, as well as interfere with your success. So let’s focus on just a few key factors.

Hydraulic Equivalence ... (H.E. further on...)

Why do you often find gold in piles of cobbles or near larger round rocks? Let’s look at the definition of H.E. *Particles of varying size, shape, and density, that fall out of a water flow and deposit in the same area are said to be “hydraulically equivalent”*. So while quartz rocks and gold are GREATLY varying in specific density, you can make them collect in the same place. Just make the quartz rock bigger and rounder. A 2” round quartz rock and one mm sphere of gold will fall through water and deposit in about the same place. (They are H.E.) In the opposite frame of thought, take two that are the same size, a ¼” round piece of gold and a ¼” round piece of quartz, and go to a fast moving river or creek. Drop them both. The gold will sink through the water and be right near your feet. The quartz rock will not fall as fast and be pushed several feet away before it settles. This process / difference is also referred to as settling velocity, but these two are NOT H.E.
The SHAPE of gold has a BIG influence on its H.E. I like to use the term hydrodynamic profile. It really explains why something like gold, which is VERY dense, can move more easily than say a piece of hematite which is almost 3 times less dense. FLAT things move more easily than spheres when either moving water or air is introduced.

H.E. is a HUGE factor in gold mining and is often one influence for classifying of materials to certain sizes. The theory being if everything is about the same size, the heaviest material will stay in our sluice. However, it also plays a role and explains why we struggle with recovery rates on things such as black beach sands. That’s a full course on its own, but if you run black beach sands... your primary loss factors will come from battling H.E. Even though the material is “naturally screened” or classified for you, H.E. makes it VERY hard to have high capture rates. It’s also a leading cause of impaction in commercial ops and why so many do things such as add hydraulic riffles. It’s one of the reasons why dredges often struggle to catch VERY fine gold. (Larger boulders running down a sluice vs. fine gold ¼ smaller than grains of salt.) It’s a battle that’s hard to win without really studying it.

So, when you SLOW DOWN a sluice you start to have a traffic jam / pile up. Things that are H.E. all want to battle for the same deposit zone and you start to gather / open the window for more “non-gold” particles to pile up. Not good.

**Incremental Processing**

Let’s build the picture in your mind. You have a city bus on a busy route. On this bus, all passengers must enter through the front of the bus. When they exit, they must leave through the back of the bus. When they enter they must fill the seats in the front of the bus first. So, every time the bus makes a stop, a shovel of dirt is put into the hopper, there is a large influx of passengers. During these times of LOADING... the first few rows fill up quickly and remain full for a short period of time. So this forces new passengers to move further down the bus. (sluice) It’s really not a question of efficiency. There’s just a bunch of folks all competing for the same seats upfront. No seats up front, you take the next available one. If all the seats get full, you never even get to sit down and exit the bus (sluice) without ever sitting. Have some passengers that sit there all day and won’t move? You’ll have people walking through the bus and exiting never sitting to take a ride. The bus is all full.

![As working zones fill up, slurry material will move down to the next zone.](image)

The BUS story should help you understand that during times of heavy loading, the first percentage of your sluice will load up heavy and take some time to exchange out. Therefore gold will keep traveling until it finds an “empty seat”. Load too heavy or have too short of a sluice and you’ll have gold ride over holding zones that are busy working and exchanging. Remember, it may take an exchange center (vortex) 3-5 seconds to fully process down material and exchange out non gold and heavies. That doesn’t seem like a long time until you actually time how long it takes for you slurry to travel down your sluice. A LOT of material and gold can pass through your sluice in 3-5 seconds.

**Where is the fear?**

The mistake that most miners make is having the FEAR... of losing gold. So they start their sluice running at the “normal” or widely accepted pitch of 1” per foot. They see gold in their tailings so their first thought is... I need to slow it down,
I’m blowing out gold, when in fact, the more likely scenario is that the gold doesn’t have a place to hide. “The bus is full”, or all the seats are taken. We need to learn how to tune and the first step is to LOSE THE FEAR of fast water and high velocity exchange.

**Time to tune, the first step is to lose all your gold.**

You heard me right ... LOSE ALL YOUR GOLD... to tune your sluice. A well-tuned sluice will have heavy gold concentrations up top, medium gold in the middle, and trace gold near the end. Yes, there will also be a small amount of gold in your tailings. (See the tailings check further down)

Because of H.E., and the bus vision, we should now understand that SLOWING DOWN our sluices can really cause problems and large losses. But, how do we know we’re not running it too fast? The answer is simple and there’s only way to eliminate that fear. RUN IT TOO FAST. Step number one in tuning a sluice is to lose all your gold because you are running it SO HOT. Yes, try and lose ALL the gold. If you skip this step, which most do, you’ll never really “get it”. What you’ll often discover is that you CAN’T lose it all. You’ll see a bare looking sluice except for a few pieces of gold.

Now, what you will find is fine gold in your tailings. So, if you were running at a crazy 15 degree pitch, let’s tone it down one or two clicks. Maybe 13 degrees and test again. Ah... getting closer. Now it’s time to start half clicks. Let’s go to 12.5 degrees. Keep adjusting until you find an acceptable capture rate for the size gold you want to hold. Slow it down too much and you’ll start to see losses again.

**Better HOTTER than slower.**

Now we’re going to blend the LONG TERM impact of H.E. with the bus story and you’ll understand why I would rather see a sluice run a bit too hot, than a bit too slow. At every stop the bus makes there are one or two passengers that simply won’t exit. They want to ride the bus all day long. They never give up their seats and by the end of the day the bus can be very full. This is why GOOD, efficient, professional commercial ops clean up every 12 – 24 hours. Yes, you’ll hear stories of ops running for days and days on the same sluice. But again, I said good, efficient, professional ops. They understand the above and understand that the laws of physics control their plant more so than a human time tables.

This is why pushing the HOT line can help on long term runs. Your sluice looks and operates quite different in the first 10 minutes from the last ten minutes. So we want to tune it with the knowledge that H.E. will cause some loading and impaction. Keeping the sluice right on the borderline of being too hot will often help the more material you run.
Gold in my tailings... tuning and testing.

There’s a common myth out there that most commercial ops know that their sluices are tuned. I can tell you from dealing with many all around the world this isn’t the case. I can also tell you that there are a handful that REALLY know what they’re doing. I’m talking about an op like one I worked with two years ago. Three main plants, onsite full-time geologist, daily testing, 12 hour rotating clean ups, etc. A fine-tuned, gold recovery machine.

But even this op understood that there is no “100%” when you start dealing with moving large amounts of material. I was called to help cure one plant’s woes. It had fallen below the 80% threshold they use for sustainability. That’s where I’m going to stop. Think about that for a moment. A LOT of prospectors and newer miners think their goal, or we would like our goal, to be 100%. Trust me.... I get it. However there is no 100% especially when you start talking about long term runs, moving large amounts of material. So if during a 12 hour shift they caught 30 ounces of gold, they lost roughly three ounces running a GOOD recovery rate of 90%. There are a lot of people that won’t see 3 ounces in their lifetime, and this “well-tuned machine” was losing it every shift. Now, that you’re wanting to know where you can work their tailings.... let’s talk about the prospector.

Prospectors should be able to tune a highbanker to run in the 97 – 99% recovery rate range. Keep in mind however that most are finding very fine gold. If you have 5000 tiny flakes in your sluice during a testing run, a 2% loss (98% recovery rate) is 100 pieces of gold in your tailings. Don’t think you have that many pieces?

Here’s our testing data.
CAREFULLY counted sub 100 mesh gold in ½ GRAIN = 769 pieces, 769 x 2 = 1538 pieces in one full GRAIN , 1538 x 15.43 = 23,731 pieces in one gram. That’s a LOT of pieces to make up a gram. Remember, if you’re going to test your sluice you HAVE to know what you’re measuring. Don’t guess; know as much as you can so the data is right.

By LOSING THE FEAR, through testing and experimenting, prospectors and miners will not only tune in their sluice, they’ll also get a great education.