



Recuperación de Oro
Recuperação de Ouro
Récupération de l'or
Добыча золота

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Patents Pending

i150 Concentrator



i350 Concentrator



ICON i150 / i350

Installation / Operation Manual

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What You Will Need to Install Your iCON

In order to install your iCON you will have to consider the following: suitable footing, electrical supply, clean/pressurized water supply, feed method, tails removal method, concentration collection. You will also need to consider the height of the concentrator relative to the slurry input and tails output.

Suitable Footing / Vertical Height

For ground level operation it is common to leave the concentrator on the pallet on which it arrives.

For installations above ground level, the feet have mounting holes and each foot should be bolted to secure the concentrator in place.

The concentrator does not have to be perfectly level. It is recommended to keep it within +/- 5 degrees of level.



A common installation error is to set the equipment at ground level and then to find out that the tails run onto the ground or that your tails piping does not have enough vertical fall to discharge the material.

Generally, you will need ¼ inch of fall per each foot of tails piping: 1 cm per meter.

Electrical Connections

The direction of rotation of the concentrator's bowl is not important. It can spin either clockwise or counter-clockwise.

Slurry pumps are directional and must rotate such that material is thrown in the direction of the discharge.

i150 Concentrator Specifications		i350 Concentrator Specifications	
Electric Motor Power	2 HP, 1.5 KW	Electric Motor Power	5 HP, 3.7 KW
Electrical Specifications	220 Volt, 1 Phase 50 or 60 hz	Electrical Specifications	208-230-/3 Phase, or 380-460/3Phase 50 or 60 hz
VFD, Soft Start Included	Yes	VFD, Soft Start Included	Yes
			

Power Generator Recommendations

For the reliability of your generator we recommend that your generator has double the capacity required by your equipment. For connection to line power, only the actual power consumption is needed.

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Connect the black and white wires of from the VFD to the hot and neutral on your generator. Connect the green wire to ground.

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Connect the white, black and red wires from the VFD to L1, L2 and L3 of your generator. The order of connection is not important. Connect the green wire to ground.

*The most common installation issue is connecting to the incorrect supply voltage. It is recommend that you use a voltmeter to confirm the proper voltage before switching the power on.

Clean Water Connection

The user will have to supply clean pressurized water to the concentrator. Connect your clean pressurized water supply to the hose barb on the plumbing manifold on the concentrator.

It is important to use the same size hose as the barb to supply this process water. A smaller hose, long hose or hose with bends/restriction will restrict the water flow and limit the pressure to the concentrator.

The process water should be fed from a dedicated supply line and pump. Connection to a manifold where other people may be using this same supply may cause wild fluctuation in the pressure and lead to unpredictable gold recovery.

The water does not have to be perfectly clean. Murky water is acceptable. The water should be clean enough to pass a 50 mesh screen.

i150 Concentrator Specifications		i350 Concentrator Specifications	
Process Water Consumption	10 to 30 liter/min, 2.6 to 8 USGPM	Process Water Consumption	3 to 5 m ³ /hr, 13 to 22 USGPM
Process Water Pressure	5 to 15 psi	Process Water Pressure	10 to 20 psi

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When the supply pump is located near the concentrator, a $\frac{3}{4}$ HP centrifugal pump is generally sufficient. If the pump has to lift the water vertically or over a long distance the pump capacity may reach 2 HP or more.

One will have to consult the pump's curves to know if it will be sufficient for long runs or high lifts. Domestic/City water is typically not sufficient due to long supply runs and small diameter pipes. Garden hoses will always be problematic due to their long length and tendency to kink/bend.

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When the supply pump is located near the concentrator a 2 HP centrifugal pump is generally sufficient.

Accessory Filters

Each concentrator arrives with a y-strainer installed in the plumbing manifold. This is only intended to protect the concentrator's bowl from becoming 'sanded' with either sand or organics. This strainer is not sufficient to filter any measureable quantity of solids or organics from the water.

If you do not have a clean water supply, an external filter will be required. Irrigation type filters are economical and available around the world. 50 mesh is recommended. They have large filters and high capacities. Recommended brands are Jain, Amiad and API.



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Slurry Feed Connection

It is important to feed a well mixed slurry to the concentrator. This is generally not an issue with alluvial mining, but with hard rock milled ore, it is possible for the slurry to 'clump' leading to poor gold recovery.

The solids capacities of the concentrators are specified in % solids by weight.

You can measure the % solids by volume and convert it with the table on the right.

First, collect a bucket of the feed slurry. Allow the solids to settle flat in the bottom of the bucket.

Measure the height of the solids from the bottom of the bucket. Measure the overall height of the liquids from the bottom of the bucket. Divide (height of solids / height of liquid) times 100.

This is the % solids by weight. As an important reference, note that 20% by volume is equal to 40% by weight.

* For Gravel with 2.65 SG			
By Volume		By Weight	
% Solids	% Water	% Solids	% Water
1%	99%	2.6%	97.4%
2%	98%	5.1%	94.9%
3%	97%	7.6%	92.4%
4%	96%	9.9%	90.1%
5%	95%	12.2%	87.8%
10%	90%	22.7%	77.3%
15%	85%	31.9%	68.1%
20%	80%	39.8%	60.2%
25%	75%	46.9%	53.1%
30%	70%	53.2%	46.8%
35%	65%	58.8%	41.2%
40%	60%	63.9%	36.1%
45%	55%	68.4%	31.6%
50%	50%	72.6%	27.4%
55%	45%	76.4%	23.6%
60%	40%	79.9%	20.1%
65%	35%	83.1%	16.9%
70%	30%	86.1%	13.9%
75%	25%	88.8%	11.2%
80%	20%	91.4%	8.6%
85%	15%	93.8%	6.2%
90%	10%	96.0%	4.0%
95%	5%	98.1%	1.9%
100%	0%	100.0%	0.0%

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The 1.5" NPT connector and hose on the i150 concentrator can easily pass the full capacity of slurry by gravity. Common feed arrangements include:

Mounting a funnel on the concentrator and feeding buckets by hand into the funnel

Mounting a hopper directly to the input and feeding the hopper both sand and water

Using the iPump connected by 1.5" hose directly to the concentrator

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A 3" NPT connector is supplied at the concentrator. This connector reduces to the 2.5" feed hose internal to the machine. 10 tph solids at 20%/80% solids/water will gravity feed through this hose. The concentrator has the capacity for 15 tph solids, but may need to be fed by a pump to achieve this capacity.

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Tails Connection

Tails flow by gravity from the concentrator. When installing your concentrator you will have to consider if you have enough vertical fall after the concentrator for the tails to flow freely from the machine. Each concentrator has a 4" 'victaulic' fitting.

Common connections include standard PVC or flexible hose to direct the tails where you want them.

The iPump 1" and iPump 3" are common options used to move the tails up out of the pit and away from your work area.

Concentrate Discharge

The concentrate discharge is directly under the bottom/center of the machine. While rinsing, the concentrates will discharge from here.

Common methods of collection include:

- Using a small bucket to collect the concentrates per batch

- Using a larger bucket or tank to collect concentrates each day

- Plumbing this discharge to an iPump when you have many machines in service

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Using Your iCON for the First Time

It is important to become familiar with your new concentrator before beginning to process your mineral. The entire installation and familiarization process should take less than ½ day.

Before turning on the power, look into the bowl using a flashlight.

Here you can see the end of the feed tube.

You can see the three concentrate riffles at the top of the bowl.

In the back of the concentrate riffles, you can see the holes/water jets.

Where the bottom of the bowl joins the wall, you see the narrow gap where the concentrate will exit the bowl. It is important to notice the size of this gap. If you feed your concentrator material larger than this gap it will plug up.

Next, hold your fingers of one hand in this gap and gently rotate the bowl with your other hand. The gap will be smooth all the way around the bowl. In the future, you may notice that the concentrate is not draining and you may feel that this gap is packed with oversized material. If this is the case you will have to form a wire into a hook and remove these oversize pebbles to allow the concentrate to flush easily.

Open the process water valve slowly while looking into the bowl. Slowly turn the bowl with one hand. Notice that all of the holes are spraying water. If, in the future, these holes are not spraying water, you will have to clean the filter or clean these holes.

Now, hold your fingers gently into these 3 concentrate riffles. Gently rotate the bowl to become accustomed to the location and feel of these riffles.

With the water supply turned on, close the process water valve and record the pressure. Now, open the process valve fully and observe the pressure - be careful not to allow this pressure to exceed 50 psi.

Spin the bowl electronically. Using the VFD control, spin the bowl at 2 hertz and then at max (i150 50 hz, i350 37 hz). Now turn on the process water and spin the bowl at min (2 hertz) and max (i150 50 hz, i350 37 hz) while observing the jets inside of the bowl. At low rpm, the jets will spray to the center of the bowl. At high rpm, water will flow, but not in the form of jets.

While the bowl is spinning and the process water is flowing, note that the water is exiting the machine through the tails outlet. Assure that that fluid is satisfactorily flowing away from your machine and work area.

Now feed water into the slurry inlet. Again ramp the rpm up and down and observe where the water flows.

Once you are satisfied with the concentrator's electrical function and satisfied with the plumbing inlets and outlets, it is time for a complete wet run. Follow the process: Standard operating procedure.

Once you have conducted a few complete wet cycles and are familiar with the entire process, it is time to feed slurry to your concentrator.

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Standard Operating Procedure

Each Day

1. Check the filter to make to make sure it is not blocked.
2. Visually inspect inside the bowl to assure water is spraying from each hole.

Starting Procedure

1. Spin the motor to desired frequency.
 - a. i150, usually 50hz
 - b. i350, usually 37 hz
2. Open the process water valve to desired pressure.
 - a. i150, 5 to 10 psi for milled ore, 15 psi for alluvial
 - b. i350, 10 to 15 psi for milled ore, 20 psi for alluvial
3. Begin to feed the slurry to the concentrator.

Rinsing Procedure (typically requires 1.5 minutes)

1. Stop the feed.
2. Close the process water valve.
3. Spin the concentrator at 2 hz.
4. Wait until the motor is at minimum rpm.
5. Gently rinse the riffles to drain the concentrate.

General Operating Comments

If the concentrator vibrates, feed it faster and more consistently.

Small diameter concentrators require nearly no maintenance. For equal g's larger concentrators will have sand exiting the bowl faster and the areas contacted by this high velocity sand will wear out quickly. In both iCONs, this wear part is a used tire, available anywhere in the world.

iCONs also have higher reliability than larger concentrators. The bowls are connected directly to the motor shafts leading to a dramatic reduction in the count of moving parts to service and replace. This leads to higher reliability.

Longer cycle times will lead to richer concentrates. Most hard rock miners use 30 minute cycles while most alluvial miners choose 1 hour cycles.

The most common complication with concentrators is when there is no gold in the feed.

The process water should be fed from a dedicated supply line and pump. Connection to a manifold where other people may be using this same supply may cause wild fluctuation in the pressure and lead to unpredictable gold recovery.

In the case of running multiple icons in series, it is recommended to use a pressure regulator at each icon. Stopping the process water at 1 concentrator may cause a pressure spike at neighboring concentrators. Use of a pressure regulator will limit the effect of this spike.

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Optimization

The concentrators are very forgiving. They do not need much fine tuning. Usually a new concentrator can be setup in ½ day and generally will not need fine tuning. An operator can be trained in ½ hour.

The operating parameters to consider include:

- Size distribution of feed
- Density of slurry
- Feed rate
- RPM
- Weight of ore/sand
- Cycle time

The water pressure and cycle time are really the only parameters to consider to optimize the iCON operation. From time to time, the operator can gently place his fingers in the riffles of the spinning bowl - at reduced rpm. If the riffles are loosely packed and the material rinses easily from the riffles, pressure is good. If the riffles are so densely packed that it is difficult to rinse them, then increase the water pressure.

For a heavy feed with considerable black sand and/or if using the iCON to upgrade a concentrate you may choose higher process water pressure: possibly 2 times the standard listed above.

Standard cycle times are 30 minutes for the hard rock ore and 60 minutes for alluvial. The simple way to assess the cycle time is to pan the tails every 5 minutes. The time at which you begin to find an increase of gold in the tails will determine your cycle time.

If you riffles are packed with other heavy minerals such as magnetite or galena, you may choose to shorten the cycle time or increase your water pressure.

If the Water Jets are Not Spraying

The y-strainer filter can be cleaned in less than 1 minute. Simply remove the drain plug, rinse the screen and reinstall the plug.

If you see that only a portion of the holes are spraying, the easiest solution is to cut a short piece of wire and 'poke' each hole to clear the blockage. This may take up to 10 minutes.

If 'poking' out the holes does not allow all the jets to spray, you will have to dis-assemble the bowl to clean out the water jacket. The bowl does not have to be removed from the shaft. You only need to remove the 16 long bolts that hold the 2 part bowl together. With these bolts removed, the bowl can separate into 2 pieces allowing you to rinse the inside of the water jacket and poke the holes from the inside out. This can be done in less than 60 minutes.

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