

Double-wall centrifuges - Falcon™ iCON

History and general description

The iCON evolved from the Falcon SB to give artisanal gold miners an affordable robust device able to recover very fine gold without mercury. Guidance and encouragement was given to Falcon Inc by Professor Marcello Veiga adviser to the Global Mercury Project. The result was the iCON concentrator in US patent application #12/446,812, publication #US 2010/0240513 A1 filed 23rd October 2007 by inventors Steve McAlister and Mark Vinchoff. Falcon is now a brand owned by Sepro Mineral Systems Corp.

The innovative iCON differs from the Falcon SB in having a common shaft that links the drive motor to the concentrator bowl. The cost of bearing assemblies is reduced, and the motor is now above the bowl and clear of the slurry, so simplifying the design. The common shaft also serves as the conduit for introducing the fluidising fluid to the bowl.

- ✘ **Drum Version** - in the patent application, the unit is encased in a 45-gallon metal Drum for transport, and the Drum supports the unit in operation. The Drum is raised on blocks to give clearance for a Concentrate Collector. The Drum Version is discontinued.
- ✘ **Current Version** - the Drum is dispensed with, and the unit is supported by 4 metal legs, giving room for the Concentrate Collector, and lowering the overall height of the unit. Due to its popularity, iCON is now a line of products and iCON Gold Recovery Corporation operates independently of its parent Sepro.

Operation

The maximum feed size is 2mm and the iCON line includes an optional 2mm screen. Accordingly the unit requires a simple coarse recovery system put in front, or else is used for processing fine tailings, upgrading concentrate or processing fine sands.

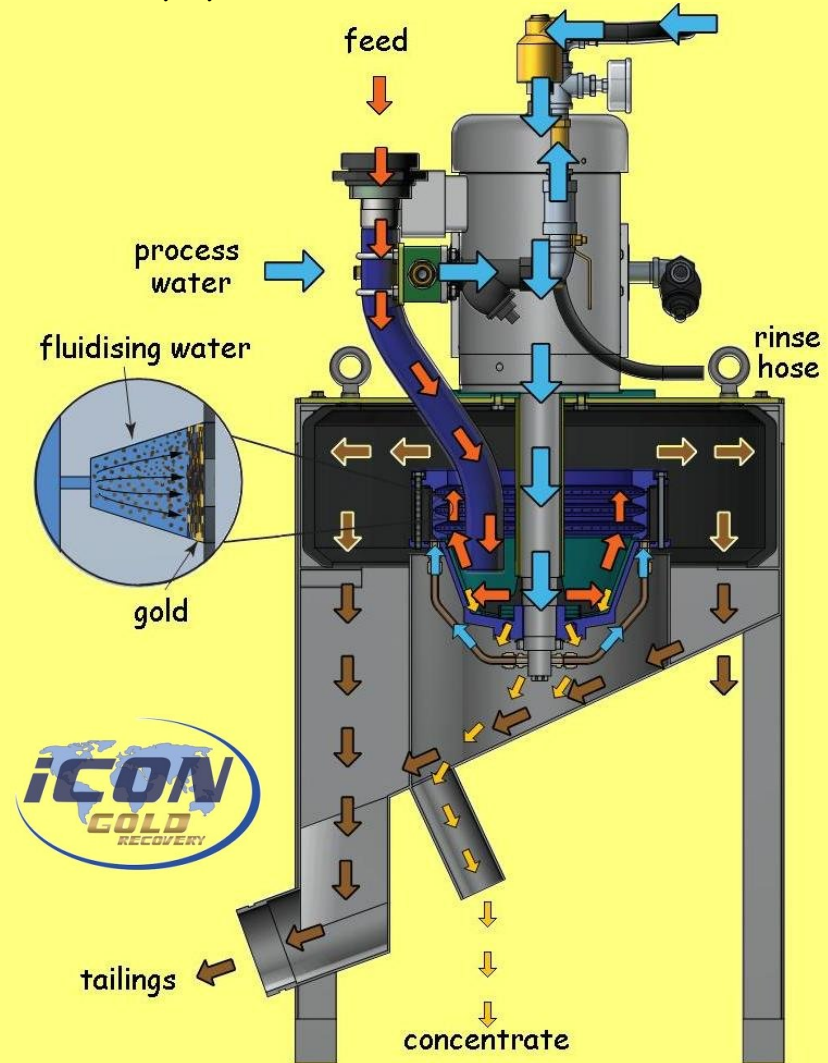
The unit stands on legs above a collection vessel to accept about 1-kilo of concentrate per rinse cycle. The unit is hooked to a 220-volt single phase electricity source, and connected to a water supply of at least 17 litres per minute under 1 bar pressure. The water supply is switched on, and next the centrifuge switched on in accordance with the manufacturer's instructions. Only then can feeding commence via the Feed Pipe supplied via a 2mm screen and feed hopper affixed above the top of the unit in a manner to allow gravity feed into the spinning centrifuge bowl. It is important to maintain feeding in as even a manner as possible. Water pressure is monitored to find the optimal pressure for best gold recovery. In the Drum Version, the first tailings accumulated inside the 45-gallon Drum to enhance stability, the later tailings overflowing via the Tailings Discharge Pipe. In the Current Version, all tailings report directly to the Discharge Pipe.

After the run cycle is finished, the feed is stopped while the centrifuge continues to spin under power. Once no feed material is entering the unit, the water pressure is turned down low sufficient only to provide positive pressure to the collection riffles. Only then is the bowl allowed to either stop or slow down to the rinse speed. Now the concentrate can be flushed out of the bowl's collection riffles by increasing the fluidisation water pressure. The Rinse Hose is used to flush the bowl clean. The concentrate is flushed out of the bottom of the unit via the Concentrate Pipe into a suitable Concentrate Collector under the unit. The 'Run time' is 30-60 minutes before gold recovery falls. Like the Falcon SB, the iCON achieves a concentration ratio of 1,000 or more, but the concentrate requires further upgrading ('cleaning'), for instance by a Blue Bowl or by a second pass through the unit.

Adoption by placer gold miners

Uses of iCON include: a) initial processing of hard rock ores, b) scavenging of hard rock tails, c) processing fine gold placers, and d) upgrading concentrates. This unit is also proving popular for prospecting and drilling because it is easily cleaned between samples. Several hundred units have been sold to artisanal miners in Africa and elsewhere. The unit has potential for recreational miners, and industrial models are now being marketed.

Gold recovery by iCON (made in Canada)



THE iCON CONCENTRATOR

✘ **BAT** - the innovative iCON evolved from the Falcon SB centrifuge, with the drive motor repositioned above the spinning centrifuge, and the drive shaft also supplying the process water. (drawing: courtesy of Matt of iCON Gold Recovery Corp - www.iconcentrator.com)

BAT and iCON centrifuge

Operational factors

Operational advantages:

- ☒ lower capital cost compared to most other gold centrifuges;
- ☒ moderate operating cost (spares, pumps and electrics);
- ☒ almost a complete gold recovery system, rather than just a centrifuge;
- ☒ fairly easy to transport (e.g. Drum Version is packed in a 45-gallon metal drum);
- ☒ black sand is kept fluidised at all times, ensuring gold can settle;
- ☒ very high % gold recovery, especially of fine gold;
- ☒ able to deal with significant amount of suspended clay; and
- ☒ low water consumption.

Operational disadvantages:

- ☒ capital cost is low but often out-of-reach of individual artisanal miners;
- ☒ feed is smaller than 2mm, requiring a coarse separator in front; or
 - ❖ only using the device for processing fine sand and concentrates.
- ☒ the concentrate requires further upgrading to recover the gold;
- ☒ only batch discharge by stopping the unit for flushing out the concentrate;
- ☒ simpler than most centrifuges but still technically demanding for some users; and
- ☒ intensive training and supervision of operators is essential.

Environmental factors

- ☒ risk to topsoil resource: not a factor.
- ☒ risk to mineral resource:
 - ❖ exceptionally high % gold recovery, even if the gold is very fine;
 - ❖ still good % gold recovery if pay gravel is clayey and clay is not fully disaggregated;
 - ❖ waste black sand may be saleable by-product;
- ☒ risk of dust generation: not a factor; but risk of dumped black sand blowing in wind!
- ☒ risk of sheet runoff and effluent discharges:
 - ❖ low water consumption, therefore less effluent to manage; and
 - ❖ reduces or eliminates need for surfactants.
- ☒ risk to surface waters: low water consumption.
- ☒ risk to biodiversity: not a factor.
- ☒ risk of poor land reclamation: not a factor (and can be part of mobile mining system);
- ☒ risk of heavy metals in doré bars: no additional risk from this method.

Key factors for BAT determination:

- ☒ % gold recovery is exceptionally high, better than for many other gravitational devices;
- ☒ able to perform adequately even if some clay in the slurry;
- ☒ unable to process coarse gravel, therefore pre-treatment is required;
- ☒ more affordable than most other gold centrifuges;
- ☒ capable of out-competing mercury for fine gold recovery;
- ☒ amenable to incorporation in a fully mobile wash-plant;
- ☒ amenable to incorporation in a concentrate upgrading system; and
- ☒ care is needed in disposal of waste tailings due to possible risk from heavy metals.

BAT conclusion

iCON concentrators are:

- ☑ **BAT for artisanal gold production and prospecting**
- ☑ **BAT for recreational gold miners**
- ☑ **BAT for industrial recovery of fine gold**

Gold recovery by iCON (made in Canada)



LEFT - Drum Version of iCON Concentrator showing the 45-gallon metal drum as an integral part of its structure. (photo: 'Rusty Happy Cam' of Alaska Gold Forum)

DRUM VERSION



RIGHT - Current Version of iCON Concentrator, with the 45-gallon drum now discarded in favour of a simple box structure supported on four legs. (photo: www.iconcentrator.com)

CURRENT VERSION

iCON CONCENTRATOR