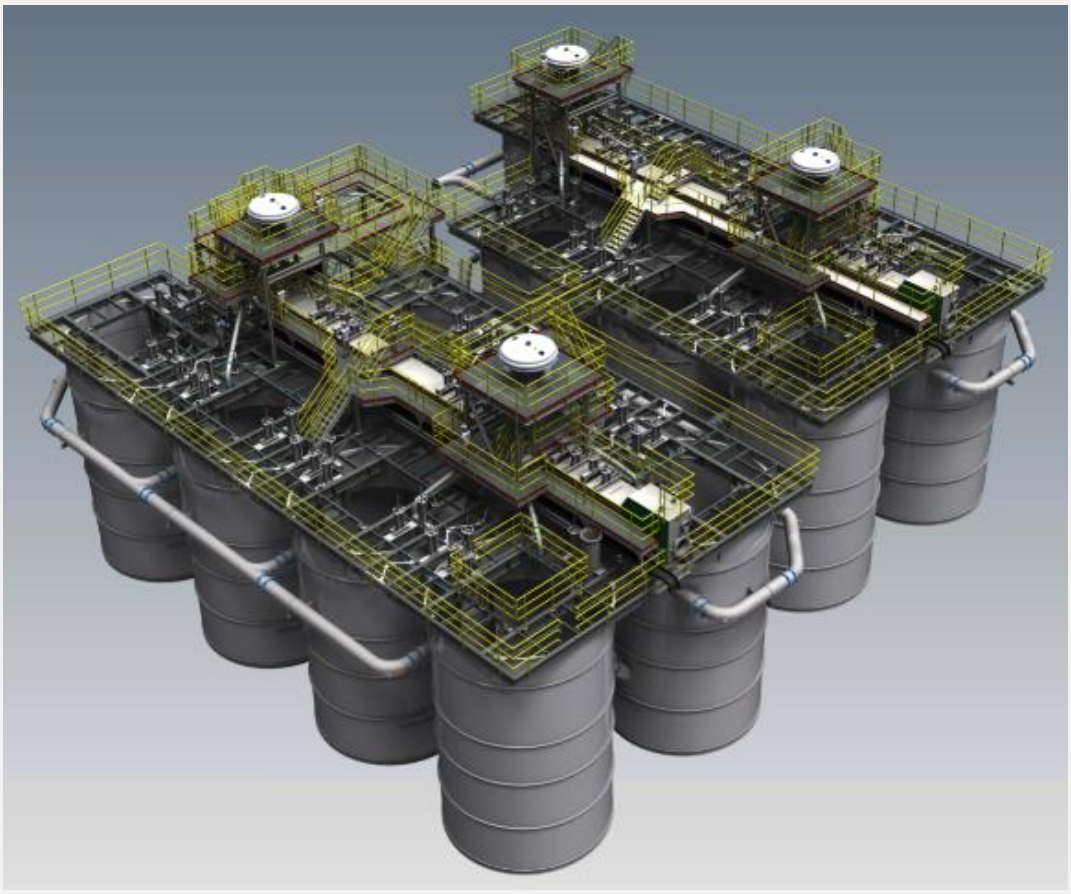
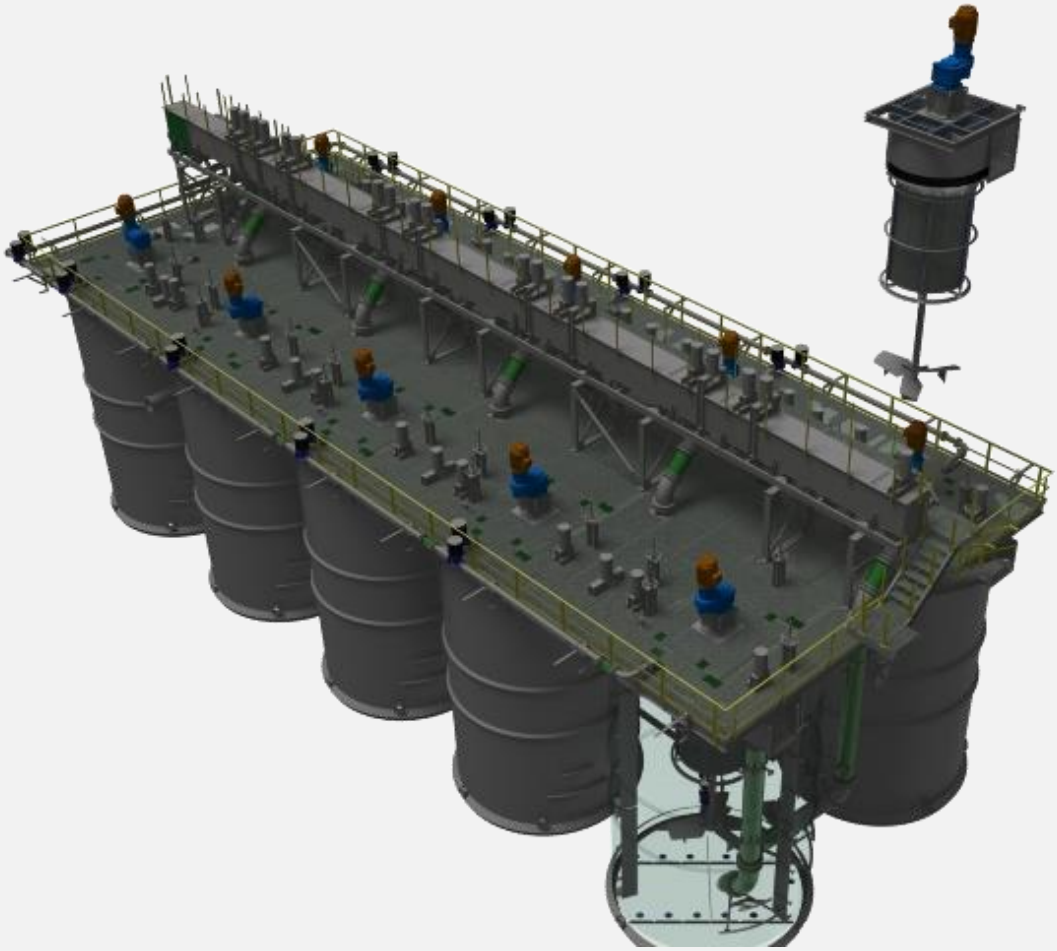
KEMIX (Pty) Ltd.

PUMPCELL



14 Stage, 330 m^3 Carbon in Pulp Pumpcell Plant complete with 21.35 m^2 Pumpcell Mechanisms



10 Stage, 150 m^3 Resin in Pulp Pumpcell Plant complete with 14 m^2 Pumpcell Mechanisms

Kemix (Pty) Ltd (Kemix) in conjunction with Anglo American Corporation (AAC) developed the Mineral Processing Separating (MPS) and Mineral Processing Separating (Pumping) (MPS(P)) Interstage screens.

The development of the MPS(P) Interstage screen was instrumental in the ultimate development of the Pumpcell. The formation of the Pumpcell concept was based on the supposition that improved carbon performance could be achieved by employing the carousel mode of operation.

The Pumpcell is in essence a complete CIP plant incorporating a Pumpcell mechanism and launder system enabling the carousel mode of operation to be employed. The carousel mode of operation involves keeping the carbon in a discreet batch within each contactor and rotating the pulp feed and discharge positions.

The pulp feed and tailings discharge positions are rotated in such a manner that the counter current movement of carbon relative to pulp is simulated without physically having to pump carbon through the circuit. The benefit associated with the carousel mode of operation is that backmixing associated with conventional counter current CIP circuits is eliminated.

Coupled to the carousel configuration, the Pumpcell design and operating philosophy is based on the fact that the circuit is operated at increased carbon concentrations and reduced residence time relative to conventional counter current CIP circuits.

The design of the Pumpcell circuit allows all contactors to be placed at the same elevation, in contrast to the stepped arrangement used for conventional cascade CIP adsorption plants. Furthermore, the potential capital and operating cost benefits coupled with the operational advantages of a carousel Pumpcell circuit is considered to offer an attractive alternative to the conventional cascade CIP process.

There is no standard Pumpcell design, each application is evaluated with the aim of optimizing the active volume of the cell, the number of the adsorption stages required, the carbon concentration and the carbon elution rate (loading cycle).

Of the Pumpcell plants installed, the active volume of the cells range from 10 m^3 to 330 m^3 providing an approximate residence time of 15 minutes per stage. The number of stages installed typically varies from six stages for lower grade operations (<6 g/t Au) to eight stages for the higher grade operations (> 6 g/t Au). Carbon concentrations vary between 30 - 60 g/l.

Pumpcell Mechanism

PUMPCELL MECHANISM DESCRIPTION

The Pumpcell Mechanism incorporates a cylindrical wedge wire basket (screen) attached to the underside of the volute.

The volute also houses the drive unit and includes a discharge launder.

Rotating around the periphery of the screen is a cage and pulse blades.

The rotating cage sets up a pulse and sweeping action around the periphery of the screen. This reduces the possibility of carbon and near size material pegging in the screen's apertures which in turn ensures that pulp flowrate through the screen is maintained.

The drive shaft of the cage is surrounded by a stationary pipe, which extends up beyond the slurry operating level. This pipe is referred to as the hydraulic seal, which ensures that pulp and carbon can not by-pass the screen, thus providing an effective seal having no moving parts.

The hydraulic seal is attached to the bottom of the screen by means of hydraulic seal base.

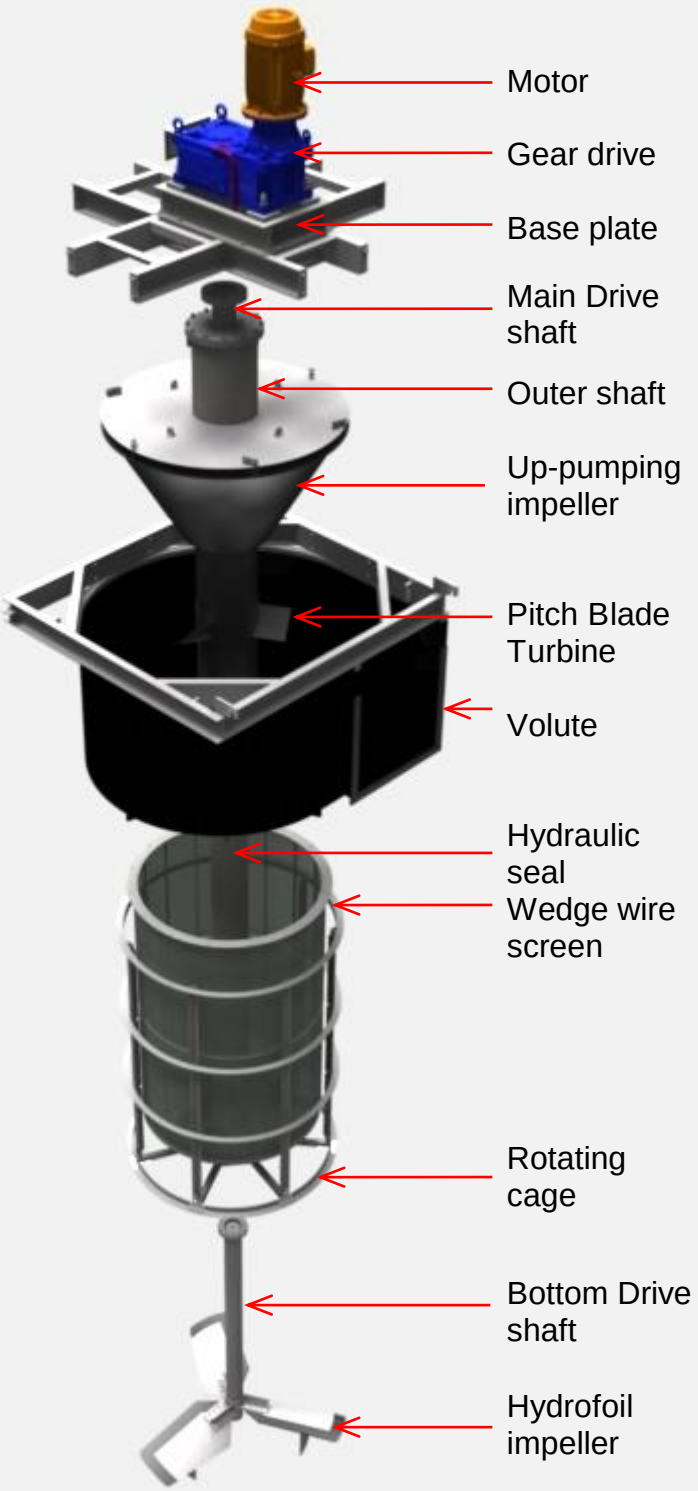
Around the stationary hydraulic seal is a hollow (outer) shaft, which is attached to the drive shaft above the top of the hydraulic seal. This hollow shaft rotates along with the main drive shaft and has a pitch blade turbine (PBT) attached which provides the agitation inside the screen basket.

The PBT blades in turn cause an upwards movement of the pulp inside the screen thus maintaining the pulp in a suspended state. This also aids in keeping the internal wedge wire area clean.

The hollow (outer) shaft of the Pumpcell Mechanism also houses the up-pumping impeller.

The pumping impeller is a mixflo type, specially designed to handle high flowrates at low tip speeds.

The up-pumping impeller elevates the pulp from inside the screen and deposits it in the launder higher than the level of the pulp in the adsorption contactor in which the screen is operating and imparts horizontal velocity. Thus, the Pumpcell Mechanism is able to generate pulp height and horizontal velocity sufficient to overcome the pressure drop around the screen, thus overcoming the need to have a series of cascade adsorption contactors.



Pumpcell Mechanism

Attached to the bottom of the drive shaft is a down pumping hydrofoil. This hydrofoil is situated in the cell to ensure that an efficient high velocity flow pattern is achieved and maintained thus reducing the possibility of pulp and carbon settlement occurring within the cell.

A single gearbox and electric motor drive the entire mechanism.

The Pumpcell Mechanism is attached to the internal launder of the adsorption tank by means of a hook-on arrangement such that the complete mechanism can be removed from the tank without having to loosen bolts.

PUMPCELL DESCRIPTION

The Pumpcell tank is comprised of an internal launder system, discharge and feed pipes, launder gate and plug valves. The internal launder is arranged such that it facilitates the individual functions of feeding pulp to the Pumpcell, discharging pulp from the Pumpcell and bypassing the Pumpcell in the event of taking the particular Pumpcell off line. This launder also connects the adjacent Pumpcells together. The nature of this launder arrangement enables the carousel mode of operation to be employed.

Pulp should be screened prior to the CIP circuit to remove grit or fibrous material thus preventing the ingress of this material into the Pumpcell circuit. The screened pulp exiting the leach circuit either gravitates or is pumped to the Pumpcell feed launder arrestor box.

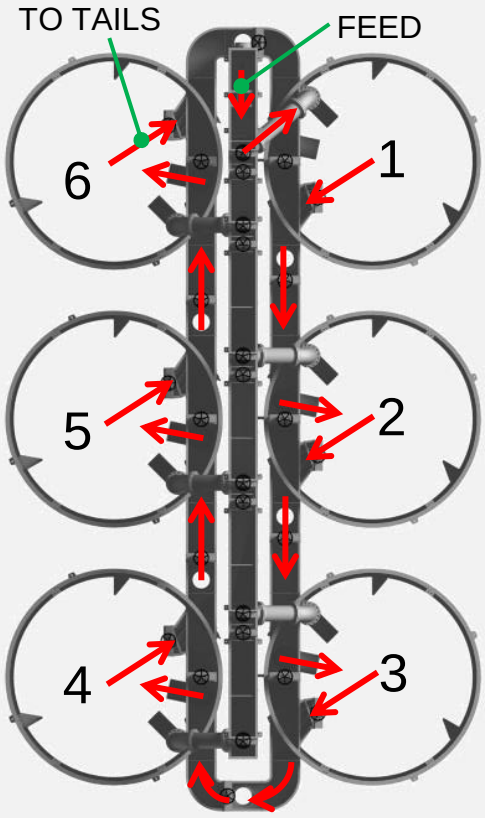
The head Pumpcell receives fresh pulp from the feed launder located above the Pumpcell top platform. The feed launder valve arrangement directs the flow of pulp into the desired Pumpcell. The pulp enters the Pumpcell via a feed pipe and is directed to an area below the down pumping hydrofoil, thus reducing the possibility of short circuiting with the Pumpcell.

The pulp flows through the Pumpcell Mechanism to the subsequent tank. Once the Pulp has passed through all the stages in the Pumpcell train the pulp exits the last Pumpcell in the carousel sequence and is directed via a residue valve and manifold to the residue screen.

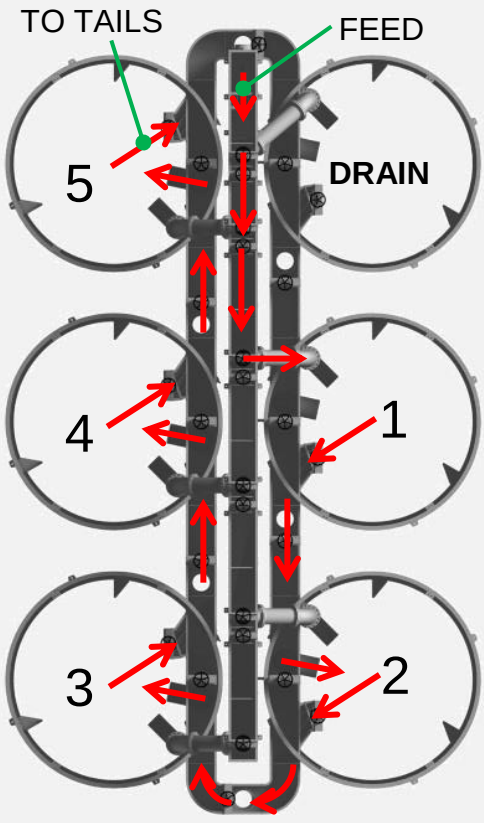
When the gold on carbon loading in the head Pumpcell has reached the predetermined value, the head Pumpcell is isolated and the feed material will be directed to the second Pumpcell in the carousel sequence.

When the content of the original head Pumpcell has been drained, that Pumpcell is brought back on line as the new tail Pumpcell.

During the draining of the head Pumpcell the entire Pumpcell plant operates with one Pumpcell less in the carousel sequence.



Normal Pumpcell Flow Conditions



Pumpcell Flow Conditions During Transfer

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