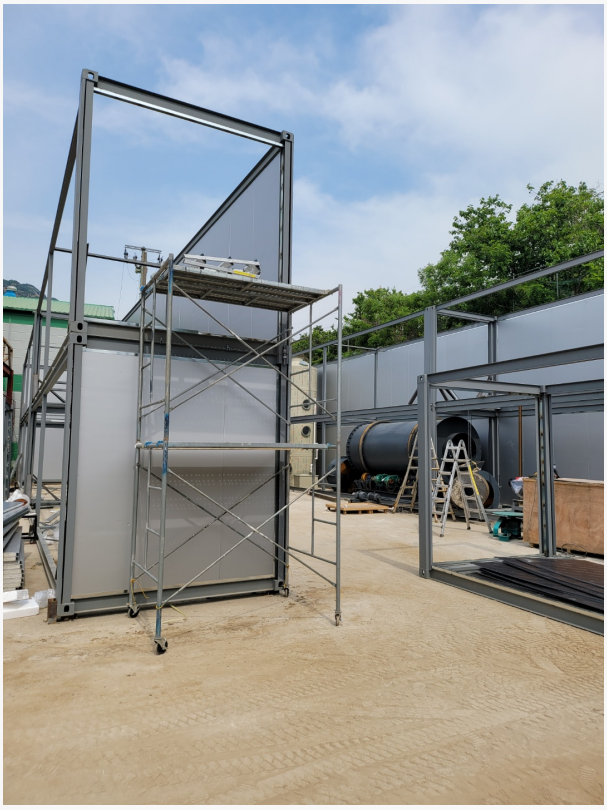
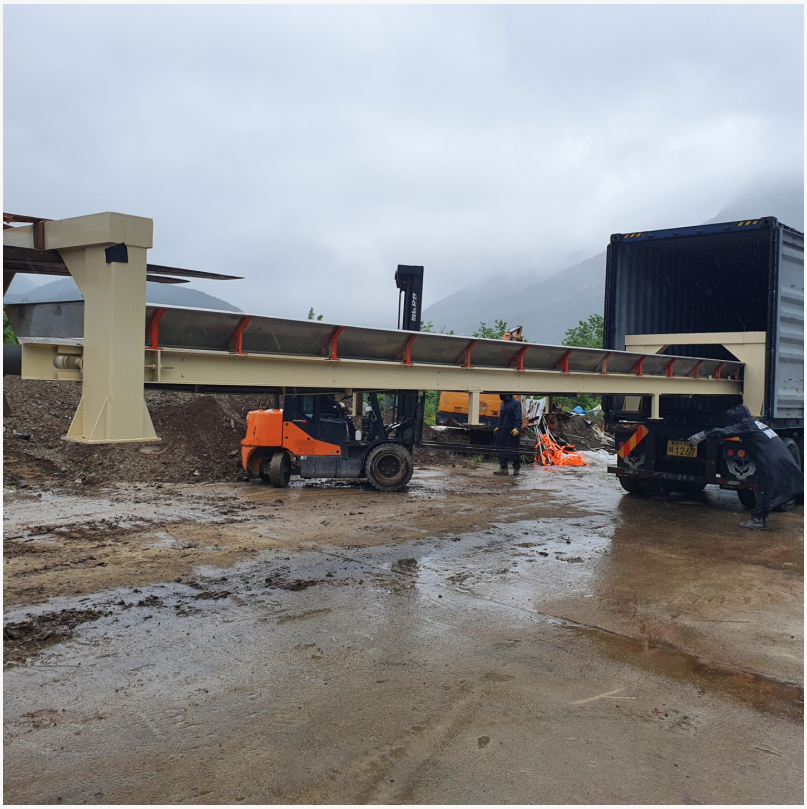
World’s First True Environmentally-Friendly Mineral Processing Plant in Unju, Korea

Avimetal won contracts for $5 million USD for six environmentally-friendly mineral processing plants. It is dry concentration



SEOUL, GABON, KOREA, June 19, 2021 /EINPresswire.com/ -- On April 30, 2021, Avimetal won contracts for $5 million USD for six environmentally-friendly mineral processing plants, with the first plant set to be completed by the end of June. Avimetal is based in the USA, a subsidiary of Coronet Metals US Inc., and has a branch office in Korea which has developed a solution for cleaning up heavy metal such as cadmium, cyanide and mercury contaminated tailings. Avimetal has begun research and development for the treatment of mining tailings and slags past 10 years, and the final results represent various environmentally-friendly processes of tailings and slags to not only clean, but also work to recover precious metal and valuable base metal from them

The Unju Mine in Korea was developed during Japanese colonial rule, and in 1997, they decided to re-develop an abandoned mine, applying for a mining license in Jeonbuk Province in December of last year – which would go on to be disapproved for violating the Mountain Management Act in January of this year.



Accordingly, residents of Yangchon-myeon, Nonsan City, near the Unju Mine, are now protesting, stating that: "If the Unju Mine is re-developed, not only will Topjeong Lake and Nonsan Stream – which are the feeding lines of Nonsan – be contaminated, but eco-friendly agricultural products such as strawberries and lettuce will also suffer great damage."

In a letter of command in the name of Mayor Hwang Myung-seon on the 18th of last month, Nonsan City expressed that: "If the Unju Mine is developed, there is a concern that the agricultural base of Nonsan will be uprooted."

Currently, the Unju Mine has approximately 1 million tons of tailings that are contaminated by cyanide and cadmium. At the time of this writing, soil contamination occurring in the abandoned mine, tailing deposits and nearby areas can be contaminated by acidic water containing heavy metals, contaminating rivers and adjacent agricultural land. In general, the phenomenon of mine damage occurs continuously for a long period of time once it starts to occur, and considerable effort and cost is required for healing and restoration. Additionally, the phenomenon of mine damage is also closely related with the natural environment and living environment, and thus it is subject to many civil complaints. As a national project, the government is now carrying out a cover project on an annual basis in order to prevent soil contamination and groundwater contamination from acid leachate and cyanides from the existing tailings landfill.

Simon Korea will clean up 1 million tons of tailings by using Avimetal's technology, and then follow-up by further developing the underground mine. Avimetal designed the plant from a crushing, milling, drying, electrostatic concentration, leaching with salt water, cyclone electrowinning system and a 100% recycling wastewater system. Avimetal's environmentally-friendly mineral processing technologies will bring about a revolution in the mining industry worldwide, in which all processes are dependent upon using tons of water and toxic chemicals. Existing mining process involve the use of gravity concentration by water and froth floatation, which requires the use of a high amount of water and chemicals.

Avimetal's system adapts a micronization milling system in the place of a ball mill or Raymond mill, saving on electrical power, plant size and finer particles of up to 400~600 mesh. Fine particles are important in mineral processing of gold ore, as most gold particles are very fine and

invisible (often called “micron silica cluster”, as a micron size of tiny gold is enclosed by silica). The finer the particle, the more gold recovery. The first step in this process is the crushing and milling in the initial stage of the mining industry. Ultra-fine micronization milling is a patented, innovative and commercialized method for particle size reduction in order to reduce – within seconds – solids that are capable of fracturing into a particle-sized powder. It replaces the likes of a conventional ball mill, impact mill, hammer mill, Raymond mill, tower mill, etc. The advent of ultra-fine micronization milling has created the profound potential to revolutionize the mineral processing industry, thanks to the benefits attained from being able to economically mill finer and enhance particle liberation for improved precious metals recovery. An ultra-fine Raptor is able to accomplish this by means of a tornado/vortex airstream, via the mechanical impact of a rotating impeller, as well as intensive vortex airstreams and high frequency of air pressure oscillation, which is generated at the backside of the rotating rotor and the groove slopes. Material is carried by the airstream and taken into the mill. The airstream that contains this material is given a spiral motion in the inlet spiral chamber, and is then evenly transmitted into the milling chamber.

Dry Concentration

Avimetal’s dry concentration is based on the principle of triboelectricity. Electrostatic concentration was used by the industry a long time ago, and it has been vey limited in the use of the mining industry, due to factors such as unit price, processing capacity and being incapable of handling tiny particles. There are two main types of electrostatic separators: gravity and electrostatic attraction. They work in similar ways, but the forces applied to the particles are different. They are both electrodynamic separators; high tension rollers or electrostatic separators. In high tension rollers, particles are charged by a corona discharge, which charges the particles that subsequently travel on a drum. The conducting particles lose their charge to the drum and are then removed from the drum with centripetal acceleration. Electrostatic plate separators work by passing a stream of particles past a charged anode. Next, the conductors lose electrons to the plate and are pulled away from the other particles, due to their induced attraction to the anode. These separators are used for particles between 75 and 250 microns, which is not applicable in mineral separation due to the incapability of micron size of the ore and a capacity of less than a hundred kilograms per hour. MIT developed a belt type separator which works on micron size tiny particles and has a large capacity of separation – 5 tons per hour – but unit cost is in the several millions of USD. Avimetal’s electrostatic separator contains plate types which have four stages of graphene-oriented anode plates and cathode pairs, and is able to treat 5 tons per hour and able to separate micron size by using the benefit of graphite’s super conductivity of electrons with low costs. It also a Full Know Down (FKD) kit concept, in which a miner can assemble the machine in few hours and save on logistic costs, when transporting at 20 times the volume ratio. The electrostatic separator is a device for separating particles by mass in a low energy charged beam, and works on the principle of corona discharge, in which two plates are placed close together and high voltage is then applied. This high voltage is used to separate the ionized particles. Electrostatic separation is a process that uses electrostatic charges to separate crushed particles of material. This process can help to remove valuable material from ore. Generally, electrostatic charges are used to attract – or repel – differently-

charged material. The Quadrant Roller Electrical Sorter is one of the major pieces of equipment in electricity mineral separation. The disadvantage of the roller type is a limit for separating micron size, as most precious metal forms come in tiny micron sizes and have a low capacity of separation. MIT has developed a tribo-electrostatic belt separator which has demonstrated the ability to process fine particles and at a large capacity. For this reason, we have developed low costs electrostatic separators which are a combination of roller type and belt type superiors. Our plate type is vertically-positioned, and 8 pairs of plates are featured in the system. The advantages of this system, compared to that of competitors, are compact size, low sales price, ability of separating micron size, large production capacity and low power usage.

Avimetal's dry concentration technology was first successfully commercialized in Quilabamba, Peru by Picchu Rio Gold Inc. The mining permit in Peru has been suspended since 2012 due to contamination of water downstream of the Amazon River by mercury and cyanide. In 2018, Picchu Rio Gold received a processing permit for the first time since 2018. The Peruvian government legalized the EPA rule for permitting for the use of Avimetal's dry concentration technology. The Avimetal company is a leading technology frontier for providing dry concentration, milling and non-cyanide leaching systems without wastewater.

Refinery
Valuable and precious metals from dry concentrated materials can be further refined by cold plasma, hot plasma gasification or a cyclone electrowinning system, followed by NaCl (salt water) hypochlorite leaching, depending on the characteristics of the ore contents.

Cold Plasma System
Plasma is a new – and potentially revolutionary – system which uses an advanced state of matter called "plasma", but it is important to note that it also a very special type of plasma, known as "cold plasma". Plasma, sometimes referred to as the "fourth state of matter", behaves like a gas, but also conducts electricity like a wire, due to the fact that it is ionized. Plasmas play key roles in several scientific and industrial applications. This unique system was invented by Richard Woodford and James Gim, and will be commercialized for metallurgical refining application. The molecules of hydrogen in the gas are ionized when a DC pulsed electric power is applied, resulting in different radicals being produced. The refining ability of hydrogen is enhanced in such a process. As the radicals reach the surface of the melt, they react with the impurities to form some volatile compounds, such as NH3, H2S and PH3. Because the compounds are insoluble into the melts, they will then be carried off by fluent gas. Finally, the impurity elements are removed from the metal. An embodiment of a cold plasma device is described, which has a reactor with a positive electrode, negative electrode, membrane and agitator. The electrode is configured to generate cold plasma, with the cold plasma having a temperature in the range of 65 to 120 degrees Fahrenheit. The membrane and electrodes are our proprietary technology, and the electrolyte is also an Nacl with our proprietary chemicals. Metals will be recovered by adjusting the PH level.

Hot Plasma System

The market needs more economical and efficient technology for head ore and slag concentration and refining technologies of precious metals in the mining industry, with the Break Even Point (BEP) of gold ore, slag and other material being at least 0.2 ounces per ton of gold. Several million tons of material are available in the region of Southwestern below 0.2 OPT and above 0.1 OPT. Plasma gasification technology has been proven to help in the recovery of value-added metals from slag or ore in the past decade. Plasma gasification is a process that converts organic matter into synthetic gas, electricity, and slag through the use of plasma. A plasma torch powered by an electric arc is used to ionize gas, as well as to catalyze organic matter into synthetic gas and solid waste. However, the cost of a plasma plant is very expensive and limited to a small capacity of production. In fact, the turnaround time of the order to installation is a year to two years, with a large amount of space also being required.
Avimetal has developed affordable low costs for a compact sized RF Plasma Gasification System from 120 KW system to 960 KW system, which will be available to install in parallel and increase capacity by implementing multiple feeders and torches in one system. It is a modular concept of the turnkey system, and is a simple plug-in system.

Cyclone Electrowinning
Cyclone electrowinning technology has a number of significant advantages over that of conventional electrowinning as a simple, single-step method for treating these solutions and overcoming the requirement to return the contained metal to the process. Its key benefits are that the cyclone electrowinning technology is capable of application at significantly higher current densities than are applied in conventional tanks. The result of this is a substantial increase in production rate per square meter of cathode, along with a resultant lowering of capital costs. From an engineering point of view, the cyclone electrowinning circuit is extremely simple, and has few moving parts. It is modular in construction, and suits progressive installation/expansion and ease of relocation. The operating windows under which the technology maintains high current efficiency and product quality are extremely broad, with one of the technology's inherent features being its capability of electrowinning metals efficiently down to very low concentrations. The cell is totally enclosed, and does not result in an acid mist problem – with consequential and potentially significant savings in capital costs in building and infrastructure.

In order to maintain high product quality, no additives are used, and electrowinning is generally performed at ambient temperature. The cyclone electrowinning cell is more tolerant of contaminants in a solution than a conventional cell is. Its high mass transport capabilities serve to maximize recovery of the target metal, and thereby minimize co-plating of other metals. Its closed nature and lack of a "water line" in the cell also result in significantly higher tolerance to entrained organics and chlorides. In its standard configuration, the cell does not contain a lead-based anode, therefore excluding a potential source of contamination of the product. Capital cost of the electrowinning circuit is relatively low, particularly when considering the size of the operation. A single cyclone electrowinning cell has only one cathode (Ti starting sheet) and our proprietary one anode (Graphene Coated Ti composite). The qualified electrolyte is pumped into the cyclone electrowinning cell from the bottom of our proprietary water turbine, and then

travels through the cell at high speed. The Cu2+ content in electrolytes will decrease, while the copper cathode deposits on the Ti cathode. Nearby, the oxygen will generate the negative anode, and then discharge from the cell. Next, it is collected and treated in a large acid mist treatment system. The final copper cathode deposits around 70~75kg per 23-hour cycle. Please contact James Gim for this article at email at jgim@coronetpm.com.

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