inppamet

A N O D O S

SINCE 1986

SUSTAINABLE MANUFACTURES OF LEAD ANODES IN THE WORLD.

We are a world leader in supplying lead anodes for the mining industry, delivering 1.6 million anodes to date.

We provide the best anodes to the world industry and deliver specialized solutions to produce copper cathodes with high quality standards, with the best competitive advantages of the hydrometallurgical market.

We have earned the trust of our customers, and that is demonstrated by being present in more than 98% of the market of Chile also we are helping to produce almost 40% of the copper (SX-EW) around the word.

nqa. ISO 9001 Registered Quality Management

BUREAU VERITAS 1828

CERTIFICATIONS.
QUALITY MANAGEMENT SYSTEM.
Certified under the Organization Standard International For Standardization
ISO 9001:201

CONTINUOUS DEVELOPMENT

About 10 to 15 years ago the service life of lead alloy anodes was on the order of 4 years, failing due to wear, buckling and/or bond failure plate/bar, mainly.

At that time Inppamet introduced “light” which meant the disappearance of the problem of buckling anodes and a much lower speed of corrosion or consumption of the anodes plate. Today the anodes plate can last more than 7 years.

However, plants today tend to operate with higher current densities and to use hoods or covers over the cells to retain acid mist over the cell, which establishes a high aggressive environment. This situation can affect early the physical integrity of Anode with consequences in energy consumption, efficiencies and product quality copper cathodes. In response to this situation, we have developed the IC Anode, much more robust in the face of the new scenario.

In response to this is that Inppamet has developed the IC Anode (injection coating) where the welds and coating mantle have been chosen to effectively protect the weld and the copper bar.

Automation in the manufacture of this type of anode also ensures a high quality product with homogeneous characteristics.

In the last 10 years we have not had any anodes deformation events in those plants that use Inppamet anodes, being during this period subjected to a range of current densities, black out, prolonged shutdown plant, etc.

The normal wear of the anodes is homogeneous, preserving thicknesses that do not vary more than 5% from one point to another (based on measurements annual follow-up of Inppamet Anodes in use).

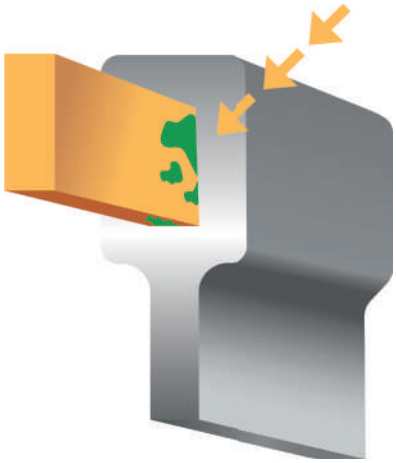
The actual corrosion rate of the Anodes Current Inppamet , based on annual measures for 10 years, it has been between 0.25 to 0.45 (mm/year) with a low average 0.3 (mm/year).

This leads to our Anodes being able to last up to 8 years and more.

SPECIFICATIONS FOR THE DIFFERENT TYPES OF ANODES ACCORDING TO PLATE-BAR JOINT

Electroplating Anode	Cast Head Anode	Injection Coating (IC) Anode
Adequate conductivity, drop less than 5 (mV) for 600 (Amp).	Adequate conductivity, drop less than 5 (mV) for 600 (Amp).	Adequate conductivity, drop less than 5 (mV) for 600 (Amp).
Average conductivity of 5 years of use, under normal conditions, up to a drop of less than 10 (mV) for 600 (Amp).	Average loss of conductivity with 5 years of use, under normal conditions, up to a drop greater than 20 (mV) to 600 (Amp).	Average loss of conductivity with 5 years of use, under normal conditions, up to a drop of less than 10 (mV) for 600 (Amp).
In extreme conditions (hoods), accelerated loss of the protective lead coating.	In extreme conditions (hoods), accelerated loss of conductivity by mist penetration at lead bar/protective coating interfaces.	In extreme conditions (bells), better behavior and protection of the welding area; and maintains conductivity.
Porous lead bath.	Bath of molten lead, non-porous.	Injected lead bath, non-porous.
The current circulates from the copper bar to the plate to through welding.	The current circulates from the copper bar necessarily through the lead-bar bath interface.	The current circulates directly from the copper bar to the plate, through the weld, ensuring an enduring electrical resistance over time.
Corrosion by penetration through the pores of the protective bath.	Corrosion by mist penetration in the interface copper bar - molten mantle.	Minimal corrosion.
Thickness of the bar coating <1 mm, electroplating type.	Thickness of the bar coating of 5-6 mm. molten type.	Thickness of the bar coating of 2-3 mm, injected type.

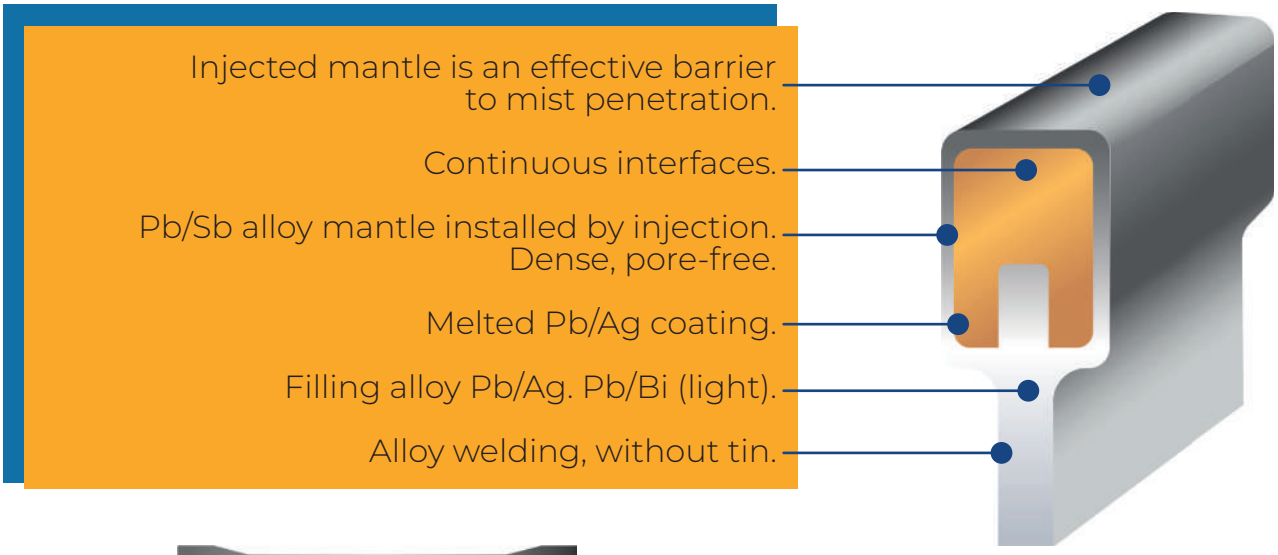
Penetration and attack in the bar/mantle interface.	Penetration and attack.

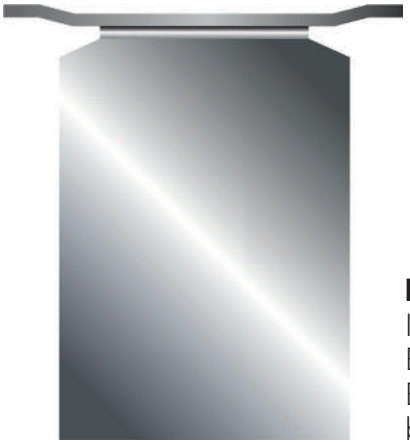


IC ANODE

MEET OUR HIGH RESISTANCE BARRIER
INSOLUBLE LEAD ANODE FOR THE COPPER INDUSTRY

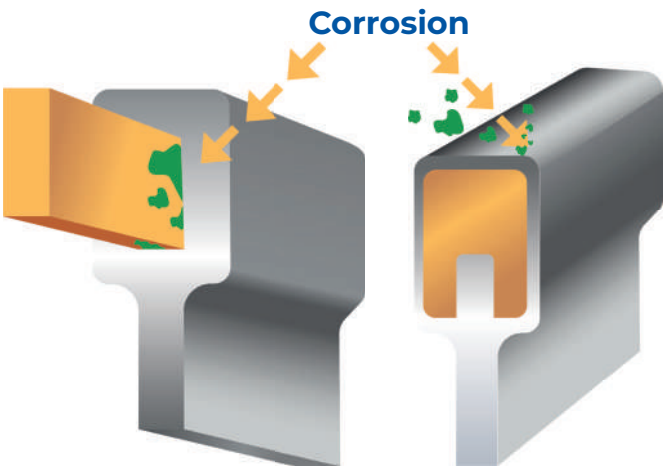
The IC anode is the standard anode of Inppamet and features a bar protection and welding system consisting basically of a coating of the copper with a molten film of a Pb-Ag alloy (the easiest to corrode tin has been removed), a combination of Pb-Sb and Pb-Bi welding to prevent injury and a pore-free injection coating.

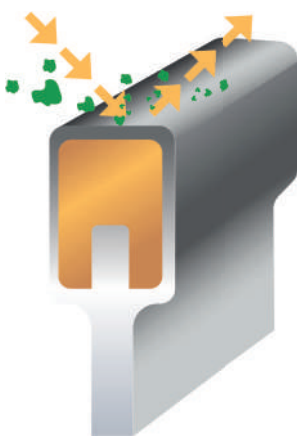




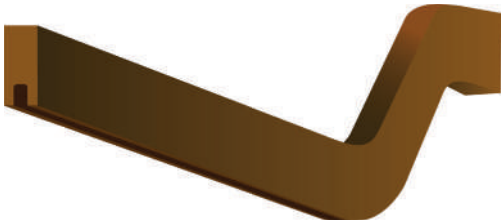
IC anode strengths
Improved conductivity.
Eliminate buckling.
Eliminates risks of detachment of the bar-plate joint.

CURRENT ANODE	IC ANODE
Acid mist penetration.	IC anode corrosion process.

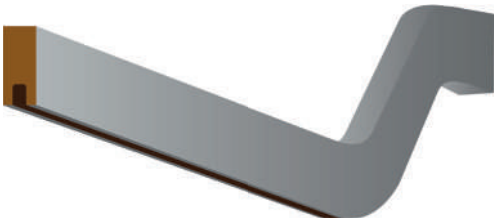




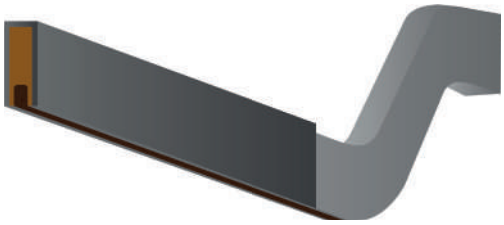
STEPS



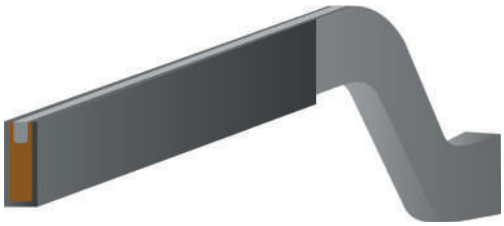
STAGE 1
FORMED AND GROOVED THE BAR.
Milling of the bar with a groove of the thickness of the plate and 19 mm deep.



STAGE 2
BAR COATING, BY IMMERSION IN A MOLTEN BATH OF PB-AG ALLOY
Better corrosion resistance and obtaining correct adhesion between the copper bar and the protective alloy mantle.



STAGE 3
PRESSURE INJECTION BAR COATING OF A PB-SB ALLOY
Filling of all interstices with sufficient thickness and absence of porosities.



STAGE 4
WELDING UNDER MELTING POINT.
Filling the groove with an alloy weld, Pb-Bi.
Prevents overheating and residual stresses, causing subsequent deformations.

STAGE 5
BAR-IRON UNION
Positioning of the groove plate with liquid welding. Stress-free welding cooling.

STAGE 6
WELDING REINFORCEMENT ROD-PLATE UNION.
Once the solidification temperature is reached, we proceed with the reinforcement welding (Pb-Sb) in the bar-plate interface area.

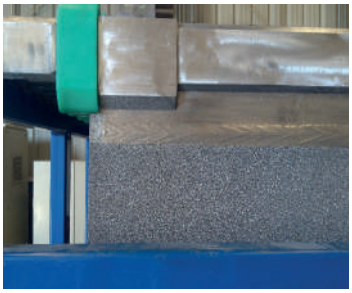
ADVANTAGES

Greater protection of the bar to the aggressiveness of corrosion of acid mist and suppressive agents.

- Metallurgical union between the Lead plate and the Copper bar.
- Excellent corrosion rate.
- No buckling.
- No detachment of the copper bar joint- Lead plate.

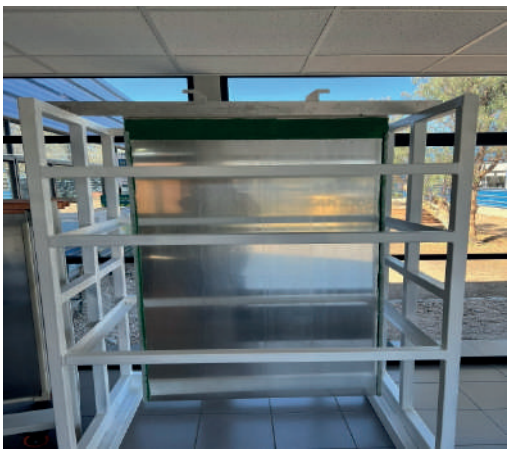
PB-AG ANODES

- Pb-Ag certified alloy.
- Solid copper bar, coated only with Pb.
- Bar-body welding with low bismuth concentration.
- Body of the anode with roughness according to what is requested by the client.
- Blasting of the anode surface with Zinc, which prevents further contamination of the process.
- Anodic insulators included according to requirements.
- Lifespan well above average.
- Circular Economy.



ALUMINIUM CATHODES

- Aluminum body according to customer design.
- Cleared copper contact to the aluminium bar.
- Interface and ear coating with certified resin.
- Plastic edges included.
- Longer lifespan.
- Low maintenance cost.



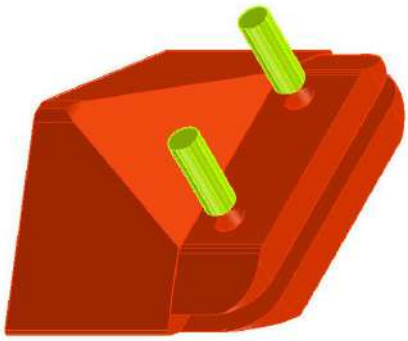
SERVICES

METALLURGICAL SUPPORT TO EW-COPPER OPERATIONS.

- Electrolyte Survey and Chemical Analysis.
- Physicochemical evaluation of Operation condition (operation potentials, pourbaix, etc.)
- Technical and Operational Recommendations depending on the survey carried out.
- Current efficiency.
- Descriptive maps of cells in operation.
- Written reports and detail of observations direct in plant.

OPERATIONAL SUPPORT TO EW-COPPER PLANTS.

- Overflow of Cells.
- Detection and elimination of short circuits.
- Alignment of electrodes in cell.
- Installation of in-line operational variable meters (temperature, flow, voltage, etc.) per cell.



MANUFACTURE OF ANODIC INSULATORS.

- We can deliver our anodes with insulators for each particular plant.
- Manufacture of all kinds of polypropylene parts and pieces.
- Positioning pyramid.




MANUFACTURE OF COPPER EQUIPOTENTIAL BARS UNDER STANDARDS B187-H04

- We manufacture all types of copper bars according to the specific requirements of each client:
  - Triangle.
  - Double Contact.
  - Circular.
  - Busbar.

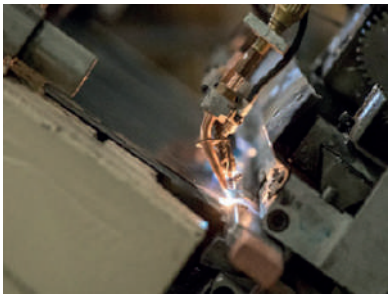
COMMERCIALIZATION OF CHEMICAL INPUTS FOR THE COPPER ELECTROOBTAINING INDUSTRY

- Cobalt Sulfate.
- Electrolyte filter media.
- Clay´s by Organic treatment.
- Smoothing Agent tuner.

SUPPORT

In agreement with our clients and according to their internal policies, we offer a permanent monitoring of the behavior of our anodes in operation at agreed frequencies, to measure:

- Measurement of voltage drop between the body and the bar
- Evolution of corrosion rate of anodes.
- Thickness measurement.
- Horizontal and vertical fullness.


INPPAMET LTDA. An entirely Chilean company, it began its activities in 1986 manufacturing molten anodes, and then began its manufacture of rolled anodes from 1990.

INPPAMET LTDA. Is proud to faithfully serve the industry with products and service of the best quality, while always knowing respond responsibly to any situation that arises from any how it affects your customers.

INPPAMET LTDA. Has supplied anodes to almost all sites mining-metallurgical from Chile, and also from Peru, Brazil, Mexico, USA, as well also in Asia and Africa.

CERTIFICATIONS
QUALITY MANAGEMENT SYSTEM
Certified under the Organization Standard
International Standardization
ISO 9001:201

AS A REFERENCE, WE WILL INDICATE AMONG OUR CLIENTS THE FOLLOWING COMPANIES AND TASKS.

CHILE
Chuquicamata - Radomiro Tomic - Gaby - El Abra - Escondida
Cerro Colorado - Lomas Bayas - El Tesoro - Collahuasi
Zaldívar - Mantos Blanco – Mantoverde
El Soldado - Los Broncos - Quebrada Blanca.

PERU
Cerro Verde - Tía María - Toquepala - Cajamarquilla.

BRAZIL
Vale - Caraiba Matais - Votarantim.

CHINA
Danxia - Zijin.

MEXICO
Cananea

inppamet@inppamet.cl
contacto@inppamet.cl

+56 5 5253 8100

Av. Las Industrias #335, Barrio Industrial, Puerto Seco.
Calama, Chile.

www.inppamet.cl