



Precious metals recovery

Founded in Bergamo in 1927, SIAD is a leading producer of industrial gases, and, in addition, offers technical support to supply proprietary technologies applied in a wide range of industrial sectors.

When it comes to the gold industry in particular, SIAD, with more than 30 years experience in the metallurgy sector, has developed several applications, designed specifically for use in the recovery and working of precious metals.

These applications include:

- ash treatment;
- ash melting which leads to the precious metals recovery;
- precious metals heat treatment.

Ash treatment

The ash preparation for metal recovery, involves decreasing the volume of the ashes through the combustion of the organic materials which support the precious metals.

It is possible to achieve incineration of the organic substances, in a rapid and ecological manner, by raising the temperature of the “combustible” matter until it reaches ignition point, and then injecting a sufficient amount of oxygen to enable combustion to proceed until the complete elimination of the organic substances.

To achieve a good combustion process, it is essential that the systems blowing oxygen or air into the materials are functioning correctly. Sufficient turbulence must be created to accelerate the chemical reactions but, at the same time, must not be so great as to transport the dust of the precious materials in the fumes to the filtering systems, or, worse still, out into the atmosphere.

SIAD technicians design and size the oxygen blowing systems to optimize the incineration process whilst preventing, however, the transportation of an excessive number of precious metal particles in the fumes.



Combustion chamber – characteristics



Melted metal from a rotating furnace for the precious metals recovery from ashes.



Crucible furnace with O₂-CH₄ burner.

Melting and metals recovery

To enable melting and the subsequent precious metals separation, a series of linked factors is necessary:

- a processing temperature sufficient to achieve high kinetic reaction rates;
- a discreet quantity of reducing gas, CO, in close contact with the metals;
- a molten slag which, apart from protecting the metal bath, acts as a “mass transportation system”;
- low turbulence, which will not disperse “precious dusts” together with the fumes.

With regard to this phase, SIAD has developed a series of oxy-methane or propane burners for use in rotary and tilting melting furnaces which, thanks to the raised flame temperature, allow greater heat transfer, in shorter time and restricted spaces and with a lower gases velocity to the chimney.

The experience and knowledge gained over the years enables SIAD’s technical staff to design and produce specific burners based on the melting furnace shape and on the methodology being applied to the use of that kind of furnace.

Molten metal alloys

In the molten phase, it is now considered “good practice” to reduce or completely avoid contact of the metal alloy with the oxygen. By so doing, apart from reducing losses due to oxidation, the inclusions of metallic oxides in the solidified alloys are avoided.

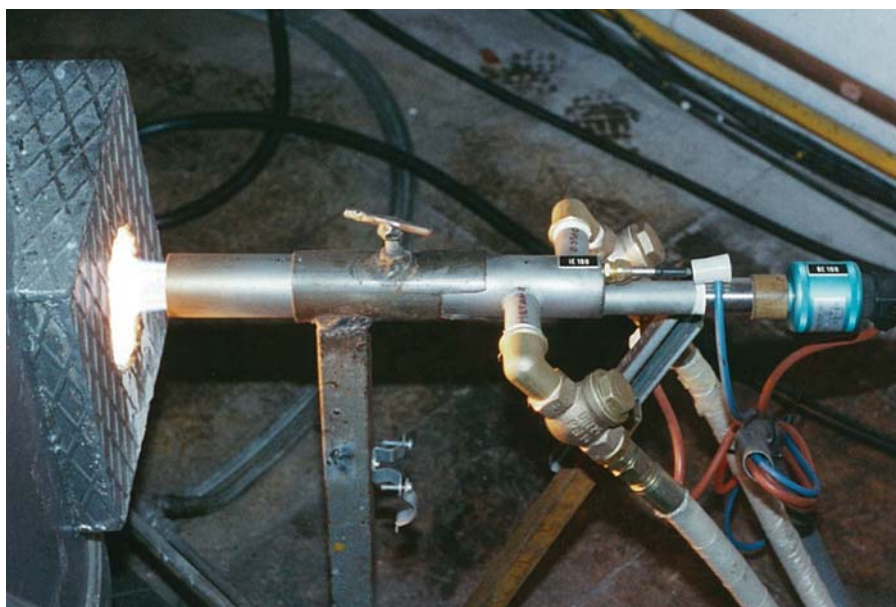
Such oxidised metals would create discontinuity in the metal structure, with consequent defects in the semi-worked products. SIAD develops and generates protective atmosphere using Argon during the metals’ solidification phase, which makes it possible to achieve a dramatic improvement in the quality of the finished alloys.

Heat treatment of metal alloys

In the subsequent wire drawing or rolling operations, or in the finishing phase, the metal heat treatment of the semi-worked or finished product becomes necessary. These operations are carried out in continuous or batch furnaces, with the introduction of synthetic protective atmospheres based on Nitrogen and Hydrogen or Carbon Dioxide and active gases. The choice of protective gas mixture will depend on the type of furnace, alloy and the thermal cycle. Based on the process to be carried out, SIAD’s technicians conduct studies, on a case by case basis, to determine the protective atmosphere which results in the most economic process.

Mechanical processing of the precious metals alloys

For the mechanical processing of precious metal alloys, SIAD offers technological solutions to optimise the manufacturing processes.



Burner for a crucible melting furnace.



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