Demand for rare-earth and precious metals continues to rise and outpace supply. The cost and availability of these materials are putting stress on the global supply chain and manufacturing productivity. For industries using brazing alloys that contain precious metals (silver, gold, platinum, and palladium) this has become a major issue both in cost of brazing material and product availability. This year, the brazing industry has seen limited supply of both silver and gold grain used to produce brazing alloys, which as a result is driving up the price and lead time.

One way to combat the increasing cost is to identify where you can recover precious metal materials from your manufacturing process and products. The recovered precious metals can offset your increasing costs and can be used to fund precious metal accounts reducing the demand on precious metal markets.

When companies are not focused on their scrap materials, most end up in a hopper with traditional metal shavings or in the garbage. The urgency is not there to improve this dynamic, but once you review your processes where precious metals are identified, the results can be astounding. Many large original equipment manufacturers, including major aerospace and medical companies, have been actively pursuing value stream mapping of all their scrap metals, including precious metals. Investigating their supply chain and doing all they can to maximize their recovery efforts where precious metals are used. In many cases, customers can recover 15% or more of their total spend internally, and if they can develop a program for

A significant value stream can be achieved by recovering brazed components after their life cycle

Pouring pure gold into a graining/shot machine.
their products after its life cycle, their recovery can be 80–95% of their total spend on precious metals. The primary driver is that all precious metals materials can be recovered and refined (the exception is products in space). As long as the value of the material exceeds the cost to extract and refine, then it is a valuable revenue stream.

Finding Precious Metal Braze Scrap

Obsolete Inventory/Manufacturing Waste

A primary area of braze scrap is from obsolete inventory, manufacturing process scrap, grindings, and floor sweeps — Fig. 1. These are the obvious areas of scrap collection, but these should be audited regularly to make sure all materials are being accounted for and there is no opportunity for improvement. Other areas of concentration should be on your lab or quality department, tooling and grinding areas, chemical cleaning, and your brazing furnace areas.

In addition to brazing alloys, other precious metals can be monitored, tracked, and recovered. This includes thermocouple wires, plating anodes, x-ray films, labware, electrical contacts, sputtering targets, chemical compounds, and much more.

Brazed Components

One major area of scrap recovery is looking at nonconforming brazed components. This can include out-of-specification products that cannot be repaired, customer returned materials, and in some cases identifying where your product(s) end up after its service life. For instance, aero-engine fuel nozzles have several braze joints that contain 0.03 to 0.07 oz of gold in each unit. With the current market price near $1800 per oz, that return is $45–125 per nozzle.

If the value of the scrapped component is higher than the cost to recover, then it’s worth collecting and refining. If you’re fortunate enough to recover your products from the field, your net cost of brazing filler metals could be reduced by 60%. A few other examples where this has been achieved include aero-engine stator assemblies, carbide tools (recovering residual silver from carbide), fuel cells, vacuum tubes components, and medical devices.

Braze Paste

Another area of opportunity is with brazing pastes. All “empty” syringes, needles, wipes, tips, plungers, paper, trays, cotton swabs, stirrers, and anything that has residue paste can be recovered. There is up to 7% of residual paste in each syringe and tip alone, and usually much more in the papers. We recommend placing a small bucket at or near every braze paste operation and collecting everything for recovery. Many paste users do not realize this value, and without a dedicated program, most end up in a landfill.

There are several examples of finding lost treasure in manufacturing facilities and adding significant value back into an organization. To know if your company could achieve such results, we recommend looking at your spend on precious metals and materials containing precious metals. If there is a significant cost, then there is significant opportunity to recapture this value.

How the Refining Process Works

Stage One: Identify — Once material is received, we segregate, weigh, and identify the incoming materials using nondestructive methods. This includes analysis by x-ray florescent, which determines the presence of pre-
WORLD’S BEST refiner of Brazing Alloys

alexymetals.com

Cious metals and its concentration percentage.

Stage Two: Induction Melting (Smelting) — The induction melting process, along with special fluxes and preparation, allow for a homogeneous melt and removes high-vapor elements and all nonmetallics — Fig. 2.

Stage Three: Assay — At this point in the process, you can determine the exact precious metal values and purity levels from the induction melt.

Stage Four: Chemical Digestion — Using a variety of chemical compositions, including aqua regia, nitric, and muriatic acids, all metals and base materials are completely dissolved.

Stage Five: Precious Metal Separation — An additional chemical process to “drop out” the precious metals from the chemical solution is performed, individually removing silver, gold, platinum, and palladium.

Stage Six: Bullion Ingots or Grain — Once all the precious metals are separated, dried, and melted into ingots or grain, they are analyzed for purity levels. Most are between 99.95% and 99.99% but can achieve 99.9995% purity by repeating the process until the desired purity is reached — Fig. 3.

Once the certified analysis is complete, the precious metals are available for sale to industry and open bullion markets. Some “lucky” materials are made back into brazing alloys again.

Conclusion

Brazing alloys containing precious metals should be carefully monitored and all areas surrounding the production, assembly, testing, brazing, and inspection should be reviewed and analyzed to see if there is opportunity to recover value from these products. In addition, if there is a way to recover your brazed components after its lifecycle, a significant value stream can be achieved.

GRAYSON ALEXY (info@alexymetals.com) is the founder and president of Alexy Metals, Willoughby, Ohio, and chair of the American Welding Society C3 Committee on Brazing and Soldering.