



Quality Technology

Introduction

Electro-Spec prides itself on working with its customers to solve problems on components that are critical to safety, life altering, lifesaving, or have high reliability standards, just to mention a few. We understand the value of advanced technology in paving the way for superior services and capabilities. Our company invests in cutting-edge equipment that boasts enhanced functionality and versatility from start to finish. This advanced technology allows us to ensure quality and safety at all levels of the plating process.

Electro-Spec utilizes state-of-the-art technology for vacuum vapor degreasing, plating, inspection, and waste water treatment.

Vacuum Vapor Degreasing

Vacuum vapor degreasing is a process in which solvents are used to dissolve contaminants on parts prior to further processing. A vacuum is utilized in conjunction with this process to improve the cleaning efficiency of the degreaser. This process serves a three-fold function to reduce solvent emissions, de-gas the solvent and dry the parts thoroughly.

Vacuum vapor degreasing technology allows Electro-Spec to begin the plating process with the cleanest parts possible. The evacuation of air in the chamber eliminates the risk that the air and solvent will interface and react with each other, creating solvent emissions. The vacuum creates a controlled and uncontaminated environment where the vapor degreasing can commence with little interference, for the best possible results.

The vacuum also serves to remove the air dissolved in the solvent. This ensures that the solvent is pure, with no non-volatile residues. Using pure, distilled solvent improves its ultrasonic power and is essential to achieving high-quality results.

Finally, the vacuum speeds up the drying process. The solvent boiling point in a vacuum is lower than it is in a full space of air. The higher the vacuum is, furthermore, the lower the boiling point. Electro-Spec's advanced vacuum vapor degreasing system also incorporates the ability to capture and reclaim the contaminated solvent as it runs off the parts. The solvent is recycled in the system, making the whole process more economical and sustainable than traditional degreasing.

Vacuum vapor degreasing is the preferred cleaning technique for parts that demand the highest standard of cleanliness, such as medical parts. It consistently delivers greater molecular cleanliness than aqueous or semi-aqueous processes. Even when compared to its simpler adaptation, vapor degreasing, vacuum vapor degreasing is more productive, cost-effective, and convenient.

Plating

Electro-Spec works closely with its suppliers/vendors to remain on the cutting edge of plating equipment technology and chemical advancements. Our plating capabilities support many different industries. We do this through automated plating lines, Spouted Bed Electrode (SBE) plating lines, selective (controlled depth) plating lines and a high speed nickel rotary line.

Automated Plating Lines

Our automated plating lines feature integrated TQR software, a tracking and production management tool that facilitates organized and efficient production. The software allows operators to monitor all phases of the plating sequence and make adjustments to times, temperatures, thickness and more based on feedback that they receive on a computer monitor.

We use an independent software module called Gravo 8.0. This program offers a high level of control for production operations. It provides interfacing by programmable logic control (PLC) and allows our operators to view, manage and control production operations in real time. The software further allows users to collect, report and analyze process data.



One of the typical drawbacks to automation is limited flexibility. This is not the case with our automated lines, which can handle diverse parts that exceed the capabilities of other processing lines. Electro-Spec's automated plating lines accommodate materials of multiple substrates, geometries, finishes, handling and thicknesses—all of which have historically caused issues for plating technicians.

Electro-Spec consistently achieves uniform, even plating on large numbers of diverse parts. Our production lines can process between 60,000-80,000 jobs per year with 8 transporters and 180 processing positions. To control the current and prevent peaks that cause irregularities, we implement rectifiers and v-saddles.

SBE Plating Lines

Spouted Bed Electrode (SBE) plating technology further expands our plating capabilities. This plating technology is ideal for micro-miniature parts, especially those that are smaller than 1 cm in width, height and length. SBE plating is also ideal for small flat pieces that tend to seat together or for parts that nest, as well as difficult, intricate geometries.

The SBE process is accomplished in a chamber with ultrasonic action and continuous solution pumped into and out of the chamber to facilitate part movement and fresh plating electrolyte during the plating process. The SBE ensures very uniform plating coverage in high and low current density areas of the part as well as in counter bores.



Currently SBE processing is incorporated in Gold, Electrolytic Ni, Electroless Ni, Copper and Palladium.

There are a number of advantages to SBE plating. It features quality plating conditions in which the parts are in constant motion and exposed to fresh electrolyte. The parts have little opportunity to nest together, as they may in other plating procedures such as barrel plating, or even vibratory plating. In addition, SBE plating is cost-effective, low-maintenance and fast.

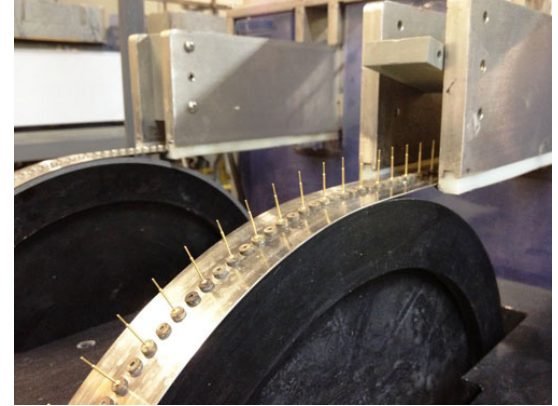
SBE plating meets the growing demand for miniature parts, as evidenced by ever shrinking electronic devices. Scientific instrumentation, medical devices and consumer electronics continue to decrease in size, which means that their components must do the same.

Electro-Spec's investment in SBE plating technology ensures that we can keep pace with the latest technological developments in a wide range of industries.

Selective Plating Lines

Selective plating is a process that uses an advanced, controlled depth system to accurately plate small areas with precision and control. It is a technique most often used to plate precious metals like gold on the critical end of a pin or contact.

Hard gold is the preferred plating material for an electrical or electronic contact finish. It does not corrode or react chemically in harsh environments and provides excellent contact wear resistance. Soft gold is ideal for lead frame wire bonding because it has an elastic quality. As a result, it is a highly reliable material in solder applications.



Electro-Spec can effectively gold plate the most critical end of a pin or contact with as much as 5 microns (.000200") while leaving the rest of the pin or contact Ni plated or with as little as .125 microns (.000005") of gold. This method typically represents as much as 70% in savings.

The plating cells use precision fluid level monitoring to produce controlled depth repeatability to within .022". Flexible tooling and transport belt design allows for a wide range of controlled depth part configurations through a conveyer system and pin carriers. By using specific inserts for each part, Electro-Spec can plate parts up to 1.75" in length and .25" in diameter.

Selective gold plating is a practical way to balance the superior properties of precious metals like gold against its high cost. It is a sensitive process that requires special considerations regarding the hardness, purity and substrate material.

High Speed Nickel Rotary Plating Line

For parts that cannot be plated using traditional rack, wire or barrel plating technology, Electro-Spec uses a rotary plating line. This high-volume rack plating technique is currently exclusive to Sulfamate Nickel plating. Conventional plating lines use “racks” to fixture parts in a variety of methods to make connection to the parts during the plating cycle. These parts traditionally see uneven plating current and therefore, plating deposition rates and thicknesses. This method is also difficult with some part geometries to properly rinse the parts from one process tank to the next. Electro-Spec’s Nickel Rotary Plating Line utilizes controlled depth plating technology with open cell tanks and a chain driven belt with hooks that line the parts up in a uniform manner. Each part receives the same amount of current, plating rates, rinsing and drying as they pass through the plating line. The movement of the plating solution and rinse water is ideal in that this solution is constantly being replenished in the plating cells as the parts move through the line. Part uniformity is dramatically improved over conventional rack plating techniques and plating lines, utilizing this advanced technology.

By incorporating pre-plate cleaning, rinses, plating and drying into one complete system, the rotary plating line saves valuable resources in time and labor, which allows Electro-Spec to pass savings on to its customers.

In addition, the entire process can be run by a single operator. The operator is responsible for loading and unloading parts at the same station on the line. Our state-of-the-art equipment completes the process from load to unload.

Closed Loop Waste Treatment System

Our one-of-a-kind, Goema/Ovivo wastewater treatment system is another example of our advanced technology. It is a closed-loop system that both treats and recycles water before it is re-introduced to the plating lines. This technology can separate six different types of metals out of the waste stream. This cleaning and distillation technology recovers over 99.9% of materials, which can then be pressed, dried, and re-purposed. We utilize this process for precious metals such as gold and silver.

Inductively Coupled Plasma (ICP)

At Electro-Spec, we use a high sample throughput Inductively Coupled Plasma – Optical Emission Spectrometer (ICP-OES) that allows us to determine fine concentrations of different elements in samples in parts per billion. This equipment can analyze up to 60 samples simultaneously, at a rate that far exceeds that of a typical atomic absorption spectrometer.

The ICP-OES is one of our most advanced techniques for analysis. It involves spraying the sample solution into the core of inductively coupled argon plasma, which reaches extremely high temperatures that transcend that of the sun's surface. Plasma temperatures can reach anywhere between 7000 and 8000 K; the sun's surface, in contrast, burns at 5778 K.

The extreme temperature of the plasma thermally excites, atomizes, and ionizes the sample. It eventually yields an intensity measurement that can be converted to elemental concentration.

Typically, the light emitted from an ICP is viewed radially with a vertical slit image in the plasma. This yields the highest upper lineal ranges. Another way to view this light is axially, which provides better detection limits than radial viewing. The best ICP systems offer the option to view the plasma in either orientation, thus taking advantage of both the best detection capabilities and widest working ranges.

Atomic Absorption (AA) Spectroscopy

Atomic absorption spectroscopy is another analytical procedure that identifies the quantity of chemical elements in a particular sample. The process involves absorbing optical radiation by free atoms that are in a gaseous state.

It begins by atomizing the sample by fragmenting it into small drops. Those drops are fed into a flame, where they interact with a known amount radiation. The interaction, manifested in quantities of light, is measured to determine the concentration of certain elements in the sample.

The light is most commonly delivered by a hollow cathode lamp (HCL). The HCL contains an inert gas such as neon or argon, at a low pressure. The sealed lamp also contains an anode and cathode that is subjected to a high voltage in order to excite the gas ions and emit radiation that are characteristic of the metal of interest. A different lamp is used to detect different elements.

Other necessary components of AA spectroscopy include a monochromator and detector. The function of the monochromator is to isolate the specific wavelength of light that is quantified, while the detector measures this light. This data is then displayed and further processed by reporting systems.

When calibrated properly, atomic absorption spectroscopy is a reliable way to detect metals in solution.

Inspection

Electro-Spec works with our customers to ensure that the inspection process meets their expectations. We have a fully functioning inspection lab that facilitates a number of different testing processes and techniques. These include x-ray fluorescence, adhesion, solderability, steam age, quench, nitric vapor porosity, aggressive sweat, ammonium sulfide, and post-plate dimensional check.

The lab also handles a host of metallurgical and analytical testing. We micro-section parts to confirm the thickness of deposit; this test is especially critical when copper is required on a copper alloy substrate. We also test metal hardness and purity, which is essential to many gold specifications, for example.

In addition, Electro-Spec maintains an inspection database of customer reports. With these reports, we are able to perform both Failure Analysis as well as Root Cause Analysis. This database calculates the number of pieces that should be inspected based upon the quantity and criticality of the customer's order. Our failure analysis reviews any past failures and makes a determination of what the root cause of the failure was. This information is then used as a basis inspections and testing of the pieces. This ensures that any previous issues are not repeated and the quality moving forward is sound.

Work Order Tracking/ Inventory Management

Electro-Spec believes in forming partnerships with its customers. Together we can provide the most functional, value added part possible! We provide transparency—which is a key component to any successful partnership—with our online tracking and expediting system. Through our online customer portal, you can access all of your orders as they are received, processed and shipped back to you in real time (updated every 30 seconds). From the time we receive the order until the time you receive it, you can track your order through this system. Regardless of your location, you can access the customer portal.

In addition to tracking your orders, you can also expedite, change shipping methods, view historical turnaround by part number, download packing lists and certificate of compliance, check shipping details, download PDF files of additional copies of documentation and manage inventory for orders shipped to us.

Electro-Spec can also help with inventory management. We adhere to kanban principles of lean and just-in-time (JIT) production. Our electronic kanban system is more streamlined than traditional kanban practices, and reduces errors associated with manual entry and lost labels (also known as kanban cards). Our logistic control system promotes a quick turnaround without compromising valuable documentation and reports.