

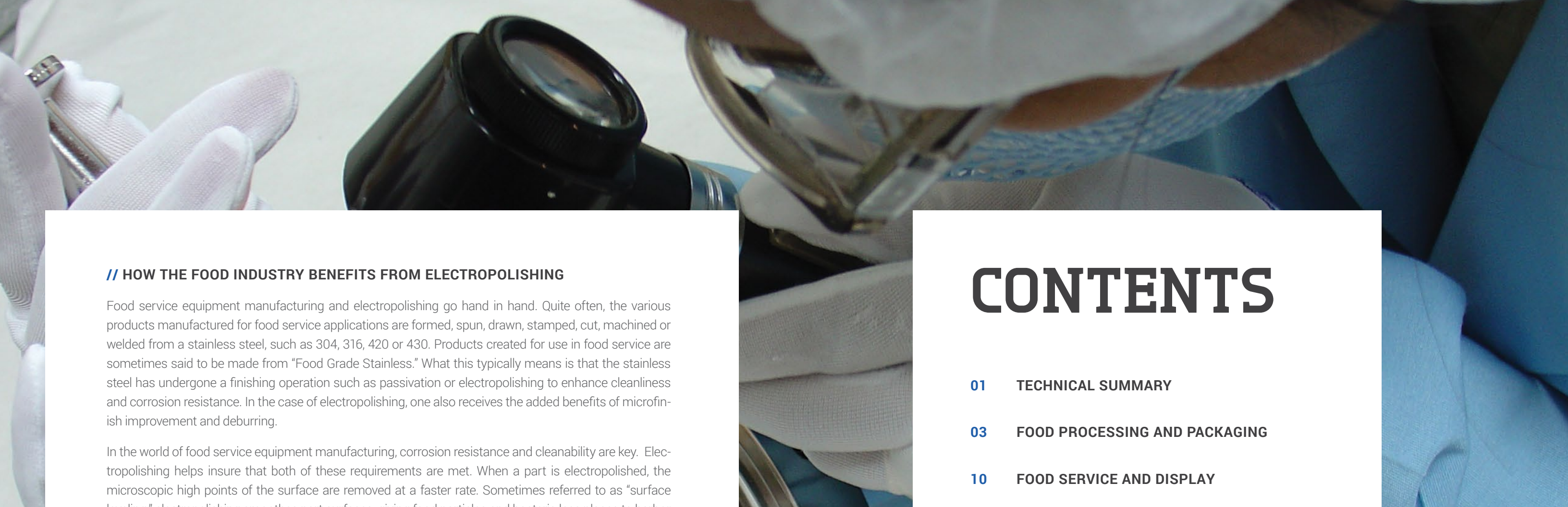


ELECTROPOLISHING

FINISHING FOR THE FOOD INDUSTRY

MEETING INDUSTRY STANDARDS FOR SANITATION IN THE FOOD INDUSTRY





// HOW THE FOOD INDUSTRY BENEFITS FROM ELECTROPOLISHING

Food service equipment manufacturing and electropolishing go hand in hand. Quite often, the various products manufactured for food service applications are formed, spun, drawn, stamped, cut, machined or welded from a stainless steel, such as 304, 316, 420 or 430. Products created for use in food service are sometimes said to be made from “Food Grade Stainless.” What this typically means is that the stainless steel has undergone a finishing operation such as passivation or electropolishing to enhance cleanliness and corrosion resistance. In the case of electropolishing, one also receives the added benefits of microfinish improvement and deburring.

In the world of food service equipment manufacturing, corrosion resistance and cleanability are key. Electropolishing helps insure that both of these requirements are met. When a part is electropolished, the microscopic high points of the surface are removed at a faster rate. Sometimes referred to as “surface leveling,” electropolishing smoothes part surfaces, giving food particles and bacteria less places to harbor or stick to. According to research done by the USDA’s ARS (Agricultural Research Service), electropolished surfaces perform better up against mechanically polished surfaces in terms of bacterial biofilm buildup in theory because of the electrochemical nature of the electropolishing process and the fact that bacteria are negatively charged. Electropolishing to a smoother surface ensures that there is less build-up in the first place and the products are easier to wipe down and quicker to clean at the end of the day.

Food service equipment is constantly being cleaned—often with harsh, chlorine containing chemicals which cause crevice corrosion and pitting on stainless steel. In addition, welded components are subject to intergranular corrosion, also referred to as “weld decay,” which is corrosion occurring in the heat affected zones. Electropolishing helps prevent against both types of corrosion. The electropolishing process removes embedded particulate, weld tint/scale, free iron and more. At the same time, electropolishing enhances the chromium to iron ratio on the surface and restores the passive layer which makes the stainless stand up longer to corrosive conditions. The icing on the cake is that the final product, in addition to functioning better, will have a bright and uniform appearance and will look that much better when your client is deciding which equipment to purchase. It’s no wonder many food service equipment manufacturers use electropolishing as a final finishing step in their process.

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WHAT IS ELECTROPOLISHING?

TECHNICAL SUMMARY

Electropolishing is often referred to as a “reverse plating” process. Electrochemical in nature, electropolishing uses a combination of rectified current and a blended chemical electrolyte bath to remove flaws from the surface of a metal part.

Since the development of electropolishing in the 1950s, substantial refinements have taken place.

Able has many electrolytes to allow for electropolishing on a broad range of metals. These newer electrolytes, combined with advanced parts handling techniques, have improved production yields on a wide range of metal products.

Today, many food service equipment manufacturers utilize electropolishing to provide part enhancements in the final step of production. Following treatment, metal parts have improved microfinish value, an ultraclean surface and enhanced corrosion resistance.

// ALLOYS WE ELECTROPOLISH

Able specializes in providing electropolishing service for a variety of common and specialty metal alloys. Here is a partial list of alloys we can electropolish:

200-300 Series Stainless Steels	Specialty Alloys	Tool Steels
400 Series Stainless Steels	Nickel Alloys	Aluminum
Precipitating Hardening Grades	Specialty Steels	Titanium
Unusual Stainless Steels	Carbon Steels	Nitinol
Copper Alloys		

// WHAT IT DOES

While the process is best known for the bright polish left on a surface, there are some important, often overlooked, benefits of this metal finishing method. These benefits include deburring, size control, microfinish improvement, ultraclean finishing, corrosion resistance and others. These metal improvement benefits are highly desirable to design and production engineers for cost savings and product lifespan improvement.

// HOW IT WORKS

The typical electropolishing installation is deceptively similar to a plating line. A power source converts AC current to DC at low voltages. A rubber-lined tank, usually fabricated from steel, is used to hold the chemical bath.

A series of copper or stainless steel cathode plates are lowered into the bath and installed to the negative (-) side of the power source. A part or group of parts is fixed to a rack made of titanium, copper or bronze. That rack in turn is fixed to the positive (+) side of the power source.

As the adjoining illustration depicts, the metal part is charged positive (anodic) and immersed into the chemical bath.

When current is applied, the electrolyte acts as a conductor to allow metal ions to be removed from the part. While the ions are drawn toward the cathode, the electrolyte maintains the dissolved metals in solution.

Gassing in the form of oxygen occurs at the metal surface, furthering the cleansing process.

Once the process is completed, the part is run through a series of cleaning and drying steps to remove clinging electrolytes. The resulting surface is ultraclean and bright. In fact, the bright surface is the most identifiable trait and is what helped coin the process name: electropolishing.

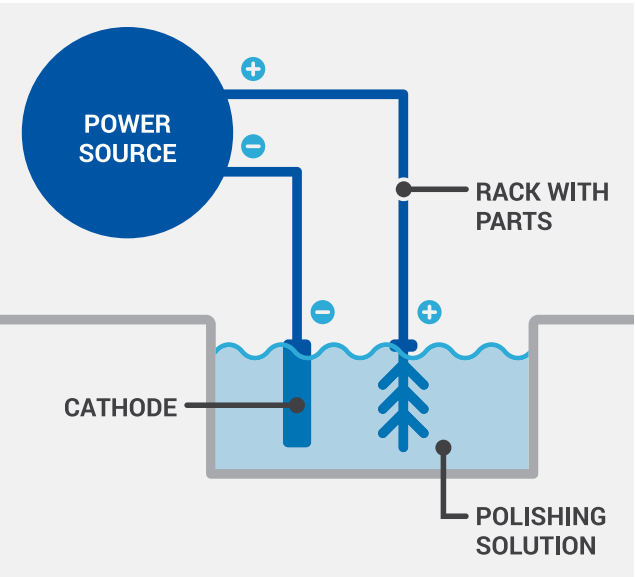


Figure 1

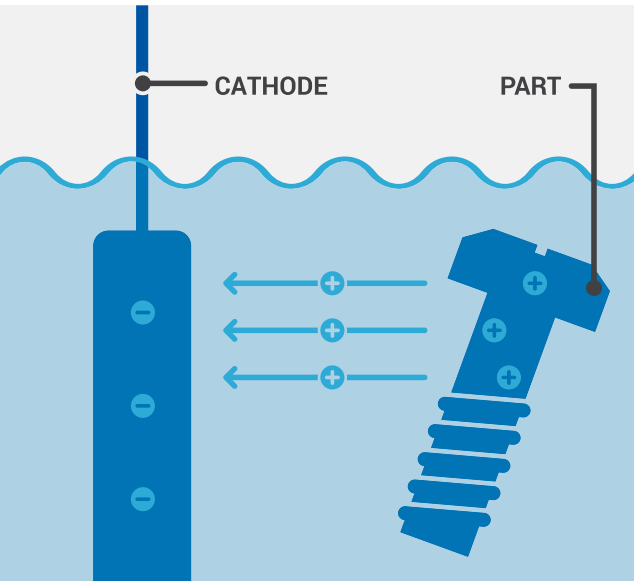


Figure 2

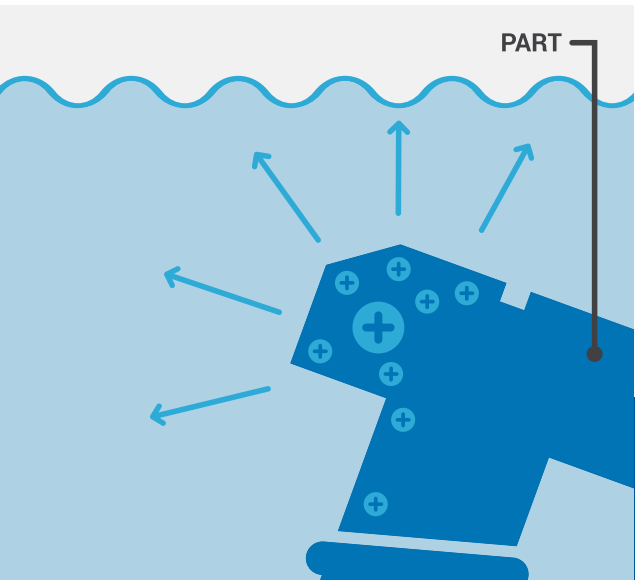


Figure 3

FOOD PROCESSING AND PACKAGING

Food processing and packaging parts must be highly sanitary for the applications in which they're used.

Cross contamination during processing, as well as bacterial colonization, produces a film of impurities on products that even chemical washes cannot permeate.¹ Contaminated machinery can compromise products and pose a threat to public health. To reduce the likelihood of bacterial attachment and other pollutant accumulation to metal parts' surfaces, products must undergo electropolishing.

THE BENEFITS

// ENDURANCE FINISHING FOR WIRE PRODUCTS

During the manufacturing process, micro-defects on the surface are left behind. These defects, often in the form of micro-cracks or pits, can become initiation sites for crack propagation or corrosion. Electropolishing produces a smooth, clean surface that prolongs parts' longevity.

// INCREASED CORROSION RESISTANCE

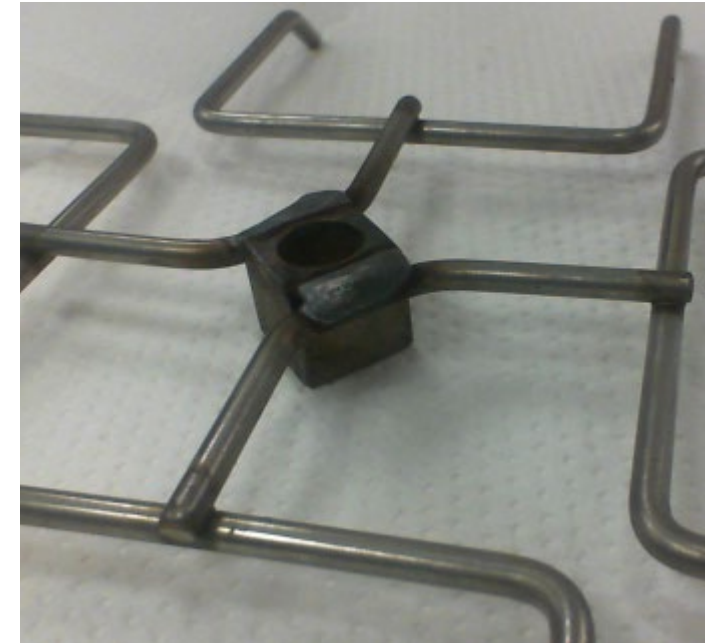
The electropolishing process dissolves the outer skin of metal, removing deeply embedded contamination in a uniform layer. Heavily contaminated surfaces such as machined parts, welded or brazed assemblies or other components that typically respond poorly to passivation alone, are good candidates for electropolishing.

CASE STUDY

Able has a long history of electropolishing stainless steel components used in the meat and poultry industry. One of our large customers manufactures wire racks, screens, molds and bacon hangers out of 304SS wire. Electropolishing is specified on their products by the end customer, who is a large producer of pork products, including bacon and lunchmeat.

By removing defects in the form of micro-cracks or pits, electropolishing eliminated initiation sites for crack propagation or corrosion.

The parts also are now corrosion resistant and have a clean, passive finish that is suitable for sanitary applications.



¹<http://www.ars.usda.gov/is/AR/archive/feb98/film0298.pdf>

FOOD PROCESSING AND PACKAGING

THE BENEFITS

// RESISTANCE TO PRODUCT ADHESION

Electropolishing achieves a bright, smooth finish that resists product adhesion and makes cleaning equipment much simpler.

// REDUCED BUILDUP OF BACTERIAL BIOFILMS

Untreated metal products used in the food processing and packaging industry are vulnerable to bacteria accumulation, and these bacteria can be difficult to remove through chemical washes. Among many other finishing treatments—such as sanding or metal polishing—electropolishing has proven to be the most effective in preventing harmful contaminants, like Salmonella, from forming on products' surfaces.¹

// 3-A SANITARY FINISHING FOR DAIRY PRODUCTS

3-A sanitary standards originated in the 1920s for dairy and milk distribution to specify the criteria for the design and fabrication of equipment that comes into contact with food.² To comply with 3-A sanitary standards, parts can be electropolished. Electropolishing provides a clean, corrosion resistant surface ideal for food processing and packaging devices.

CASE STUDY

One of our customers required electropolishing on a 304 stainless steel hopper. Because the part was blasted during fabrication, the impingement on the metal surface made it susceptible to product buildup. The customer experienced severe product flow and cleaning problems during applications involving powdered food products.

Electropolishing enhanced the blasted surface. Electropolishing smoothed out the imperfections left behind by blasting and other fabrication processes. Even microscopic imperfections cause product buildup and cleaning problems, but electropolishing eliminated even the smallest peaks and valleys on the surface of the alloy.

By eliminating surface defects on the surface of the hopper, electropolishing made the powder product flow more readily and improved cleaning times during normal product maintenance.



¹<http://www.ncbi.nlm.nih.gov/pubmed/23628616>

²<http://www.fda.gov/downloads/MedicalDevices/NewsEvents/WorkshopsConferences/UCM268705.pdf>

FOOD PROCESSING AND PACKAGING

THE BENEFITS

// REMOVE WELD DISCOLORATION

During fabrication for food service and displays, weldments may incur discoloration around the joints. To remove the welding discoloration, assemblies can be submitted for electropolishing. Electropolishing creates a uniform finish that is resistant to food stains and retains its bright, brilliant clean appearance even after repeated cleaning. Unlike coating or plating, the passive surface won't chip or flake.

// DEBURRING OF BLADES

During machining, burrs and jagged edges can be introduced into blades. These burrs could pose a health risk, especially in food applications. Electropolishing removes surface material to create smooth edges that comply with sanitation standards.

COMMONLY ELECTROPOLISHED PRODUCTS FOR FOOD PROCESSING AND PACKAGING

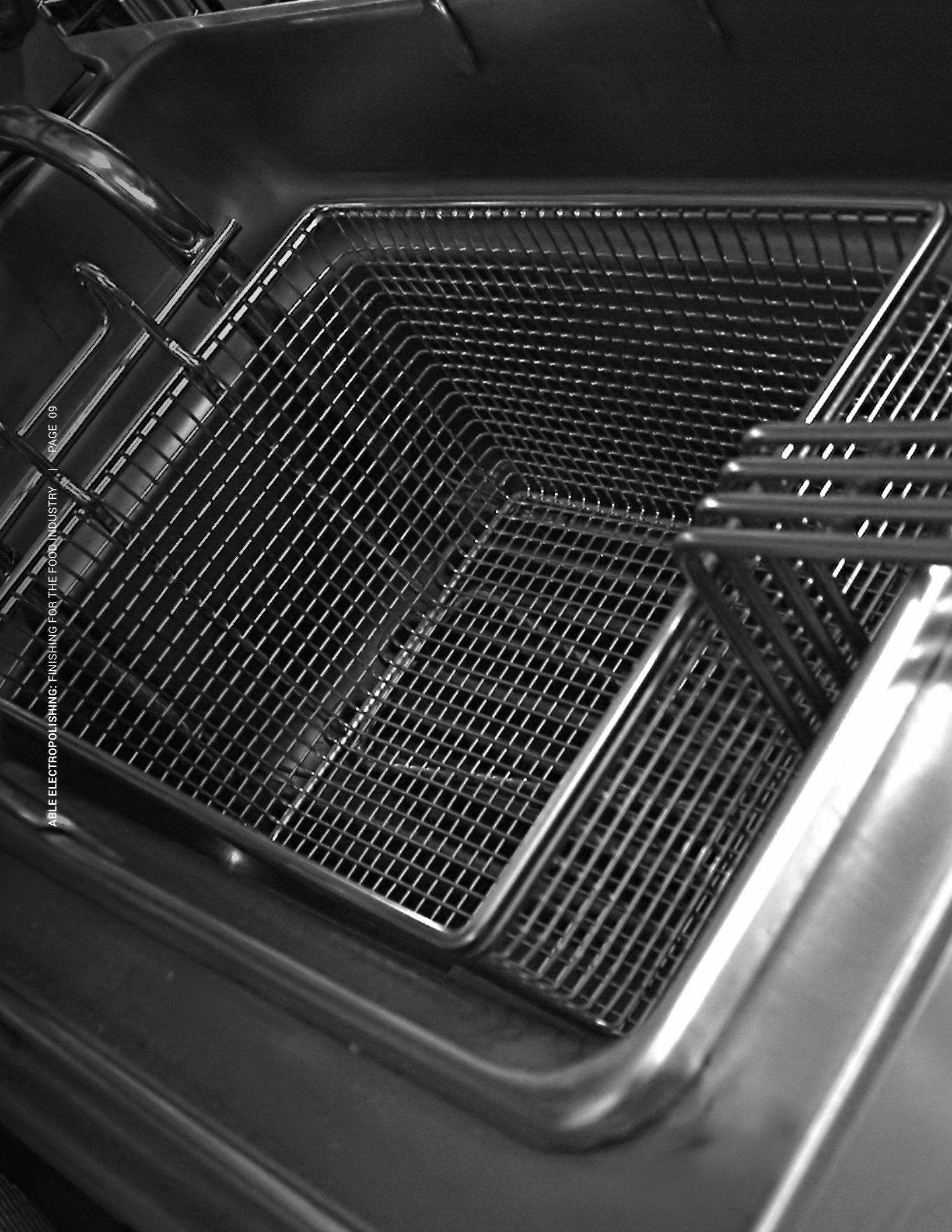
- Augers
- Wire Products
- Process Equipment (Mixers, Hoppers, Fittings, Tanks & Chutes)
- Blades

CASE STUDY

Our customer had a formed and welded stainless steel part used in a food heating system for a major fast food chain. The customer needed the part to have a uniform, stain-free appearance. However, as is the case when stainless steel is welded, the heat from the welding creates lasting discoloration and contaminates the surface metal. The discoloration is not just a cosmetic issue—it is a source for a contaminated oxide from the heat, which significantly reduces the part's corrosion resistance and cleanliness. The welding created a difficult and potentially costly finishing problem.

After contacting Able, the client received a part that was clean and bright inside and out. Electropolishing removed imperfections on the metal's surface, including the discolored contamination created by welding at a cost much less than mechanical polishing.

For these reasons, our food equipment customers continue to choose Able Electropolishing for their metal finishing needs.



FOOD SERVICE AND DISPLAY

Products used in the food service and display industry must be sanitary, as well as attractive, to assure consumer food products are safe.

Electropolishing can reduce bacterial and biofilm formation on the surfaces and produce a decorative finish that's necessary for products used for food services and displays.

THE BENEFITS

// REMOVE WELD DISCOLORATION FOR WIRE PRODUCTS

After fabricating the various wire weldments for food service and display items, components have black discoloration at the weld joints. By removing ions from the surface, electropolishing is effective in removing the outer skin of metal, containing the discoloration in the heat-affected zone.

CASE STUDY

An Able customer has a shelf used in a food service application and, as such, needed a clean assembly with a corrosion-resistant surface. The client also desired to remove weld discoloration left behind by manufacturing. Additionally, the surfaces for this part needed to be cleaned more easily, with minimal food adhesion.

Electropolishing the stainless steel removed the weld discoloration and sub-surface contamination.

Unlike abrasive mechanical polishing, electropolishing is an electro-chemical process ideal for complex parts like wire shelving. The process strips off a precisely controlled layer of surface metal. In this case, stripping away the surface metal eliminated the discolored areas and embedded contaminants. Doing so also improved the part's corrosion resistance. Electropolishing leaves behind only the native alloy and not a coating, so there is no risk of flaking, peeling, or cracking. By removing peaks and valleys electropolishing gave the material superior smoothness that makes it easier to clean.

FOOD SERVICE AND DISPLAY

THE BENEFITS

// DECORATIVE FINISH

Products used in food service and displays must be in their most attractive state to enhance companies' brands and gain consumer trust. Electropolishing enhances the appearance of these parts. Following treatment, parts have a bright, shiny surface that will resist oxidation.

// REDUCES BUILDUP OF BACTERIAL BIOFILMS

Over time, bacteria and biofilm can develop and colonize on the surfaces of metal products. This bacterial biofilm can pose a severe health threat if products are not treated.¹ Electropolishing, however, can produce a clean surface that is less likely to harbor bacteria that could contaminate a product.

CASE STUDY

Our customer makes a part that is a highly visible lever on a commercial ice machine. The customer needed a bright, clean part that would be aesthetically pleasing. The welding operation left significant scale and heat discoloration on the wire. The part also needed a high level of corrosion resistance because it comes in constant contact with ice and water.

Electropolishing removed the weld discoloration and scale from the part, giving it a bright, shiny chrome-like appearance.

Because electropolishing removed a controlled layer of surface metal from the part's entire surface area, it cleared away the discoloration caused by welding and other forming processes in a single, efficient step. Able Electropolishing also made the lever highly corrosion resistant.

CASE STUDY

Through the years, Able Electropolishing has finished thousands of deep drawn products such as trays, pots and tanks used in restaurant food service applications. One particular application involved a 304 SS drawn pan that was used for a steam table in a restaurant. Our customer was currently bead blasting to remove staining from the annealing operation used when drawing the part. They were looking for a process to replace the bead blasting that would remove the stains from annealing and create a clean appearance. In addition, due to the corrosive environment of steam and hot water, they wanted to improve the corrosion resistance.

Based on our recommendation, our customer sent samples that we electropolished for evaluation and testing.

In addition to the electropolishing, our customer asked us to laser mark their part number, logo and date code on the bottom of the pan. Using one vendor for both operations was attractive due to the cost and time savings.

¹<http://www.ncbi.nlm.nih.gov/pubmed/23628616>

FOOD SERVICE AND DISPLAY

THE BENEFITS

// IMPROVED CORROSION RESISTANCE

Electropolishing removes a uniform layer of outer surface material to create a smooth, clean surface. By removing the iron that rises to the surface during welding, electropolishing creates a chromium rich, passive surface that greatly enhances the corrosion resistance.

CASE STUDY

The customer had a stainless tray that is constantly immersed in cooking oil and in contact with food products. The part was fabricated from multiple stainless steel alloys that have been perforated and spot welded, and the final assembly has numerous points of surface contamination. The client came to Able to improve the part's corrosion resistance and cleanability.

Electropolishing cleaned all of this part's weld areas and perforations, leaving behind a smooth and easy-to-clean surface.

The surface was visibly cleaner with a shiny and aesthetically-pleasing appearance.

COMMONLY ELECTROPOLISHED PRODUCTS FOR FOOD SERVICE AND DISPLAY

Pans
Wire Products

Condiment Dispensers
Levers for Ice Machines

THE BENEFITS

// RESISTANCE TO PRODUCT ADHESION

By removing the high peaks in the material the surface becomes smoother reducing product and bacteria build-up and making the parts easier to sanitize without the use of harsh chemical cleaners.¹

CASE STUDY

Electropolishing is specified by manufacturers of soft drinks and beer for parts that come in contact with their products. We currently electropolish a liner and cup rest made from 304 SS that are assembled on a machine for mixing and dispensing soft drinks. Since the machine is used in restaurants for self-service, the manufacturer required that surfaces that are exposed to the consumer be finished properly.

The electropolishing treatment achieved a bright, smooth finish that resists product adhesion.

As a result, sticky soda can be easily removed with household cleaners and the bright electropolished finish will remain indefinitely after continuous cleaning.

¹<http://www.ars.usda.gov/is/AR/archive/feb98/film0298.pdf>

APPLIANCE AND CONSUMER PRODUCTS

Untreated metal parts in appliance and consumer products can be difficult to clean and could even develop initiation sites for corrosion.

These parts also have weld discoloration and a dull appearance that is unattractive for consumers. Electropolishing can enhance these parts for functionality and aesthetics.

THE BENEFITS

// REMOVE WELD DISCOLORATION ON WIRE PRODUCTS

When stainless steel is welded, the heat applied to the material creates a condition known as carbide precipitation. In addition to changing the grain structure of the weldment, this condition also lowers the resistance to corrosion. Electropolishing brightens and cleans the wire, removes the discoloration in the heat-affected zones (HAZ) and greatly improves corrosion resistance.

// DEBURRING

Metal parts for appliances and consumer products cannot have any burrs. To ensure the parts used in these products are free of burrs and jagged edges, they can be electropolished. After treatment, parts will have a smooth surface safe for food applications.

CASE STUDY

Our customer manufactures a 420 stainless steel blade used on high-end vegetable peelers. After the grinding operation, the blade edges are left sharp but ragged. The grinding burrs need to be removed in order for the blade to slide and cut smoothly. The product must also be free of any metal shavings, as it comes in contact with food. After researching various deburring options, the manufacturer of this high volume product found electropolishing to be the most consistent and cost-effective method to finish the blade component of the peeler.

As the final operation, electropolishing serves to both deburr and clean the part.

Once electropolished, the blades are burr-free and sharper than in the initial condition.





THE BENEFITS

// DECORATIVE FINISH

Untreated metal parts for appliances and consumer products have a dull finish. After electropolishing, these parts have a noticeable bright, shiny appearance that cannot be achieved by traditional metal finishing methods or passivation.

// IMPROVED CORROSION RESISTANCE

Metal parts used in appliances and consumer applications must be in excellent condition to enhance product performance and longevity. Following electropolishing, products have reduced initiation sites where corrosion could form.

// RESISTANCE TO PRODUCT ADHESION

Metal parts that have not undergone secondary finishing can have uneven surfaces. Electropolishing removes high peaks in the surface material to produce a smooth surface that reduces product buildup, making the part easier to clean. Additionally, because parts are easier to clean, electropolishing can also foster improved food safety.¹

COMMONLY ELECTROPOLISHED APPLIANCE AND CONSUMER PRODUCTS

- Augers
- Ice Crusher Blades
- Blades
- Decanters & Brew Baskets
- Wire Products
- Utensils
- Cooking Pans

CASE STUDY

Customers often ask Able which metal finishing method best provides the removal of embedded materials and enhances corrosion resistance: passivation or electropolishing. To portray the benefits of passivation versus electropolishing, we subjected sets of parts to the ASTM B-117 salt spray test at an independent testing facility.

The test parts included a formed auger made from 430 stainless steel. The testing was performed on each part in the raw, passivated and electropolished state.

After 144 hours of exposure in the salt spray cabinet, the raw and passivated parts exhibited advanced red corrosion.

The electropolished part exhibited light red corrosion and showed the superior corrosion resistance gained with the use of Able's electropolishing process.



Auger Raw



Auger Electropolished



Auger Passivated

¹<http://www.prairieswine.com/pdf/3016.pdf>

ABLE ELECTROPOLISHING

ABOUT US



Founder Zen Pokvitis

// METAL FINISHING EXCELLENCE SINCE 1954

Production and engineering breakthroughs achieved during WWII led to new and exciting metal finishing technologies as industry shifted from the war economy. Our founder, Zen Pokvitis, was on the leading edge of those developments and focused his chemical background on production applications for electropolishing. That experience in chemical formulation and equipment design led to the founding of Able Electropolishing Company in 1954, which began focusing on the needs of metalworking companies nationally.

// A COMMITMENT TO ENVIRONMENTAL SUSTAINABILITY

Able continues to make large investments in our facility to make sure we are in compliance with the stringent environmental guidelines now being enforced by federal, state and local regulatory agencies. Our investment in practices that support environmental sustainability means we're ready to serve our customers today and in the future.

// THE NEXT GENERATION OF INNOVATION, SERVICE & EXPERTISE

Today, Able Electropolishing is America's largest electropolishing specialist, employing more than 150 people on three shifts at our 40,000 sq. ft., state-of-the-art facility in Chicago, Ill. Thousands of companies in nearly every industry worldwide utilize Able technology for their metal parts.

Though our technology plays a vital role in serving customers, the traditions of service and attention to quality are what make Able Electropolishing a unique company.

Our entire company is tuned to the concept of doing the job right the first time. We have long recognized that metal finishing is the "last step" for many companies designing and producing metal parts, and we are often the lifeline for companies faced with assembly line shutdowns due to parts that are late or malfunctioning. Being part of the solution and meeting tough deadlines has established Able as the preferred vendor for so many companies.

OTHER SERVICES WE PROVIDE

While electropolishing is our signature service, we also have other metal finishing capabilities to enhance your parts. In addition to electropolishing, our other services include:

- Passivation
- Contract Cleaning
- Titanium Color Anodizing
- Laser Engraving
- Bake Out
- Custom Packaging

// THE ABLE DIFFERENCE: EXPERTISE & EFFICIENCY

Able Electropolishing takes pride in our exceptional electropolishing process. By providing our signature metal finishing service to food service equipment manufacturers, we give our customers corrosion-resistant equipment that has a surface that is easy to clean.

// INDUSTRY STANDARDS

We meet the following industry standards:

AMS 2700	ASTM A967
ASME BPE	ASTM B912
ASTM A380	ASTM F86

We are also an ISO 9001: 2008 and ISO: 13485 registered company. These standards allow us to provide finishing services for critical parts in industries like pharmaceutical, medical device manufacturing, aerospace, automotive and more.

// QUALITY STANDARDS & CERTIFICATIONS

At Able Electropolishing, we strive to satisfy our customers with every metal finishing job we complete. This includes adhering to international standards of excellence, ensuring that we consistently provide a variety of high-quality metal finishing services. We meet standards set by:

- ASTM (*The American Society for Testing and Materials*)
- ASME (*The American Society of Mechanical Engineers*)
- SAE (*The Society of Automotive Engineers*)
- ISO (*The International Organization for Standardization*)

By meeting or exceeding the various standards and quality management system requirements set by these organizations, we can provide services like electropolishing, passivation and more while giving our clients a sense of true security and consistency in our quality.

When you work with Able Electropolishing, you can enjoy the peace of mind that we are meeting high standards, whether you're sending us one part or thousands.

We continue to add state-of-the-art equipment to keep at the forefront of our industry.



E: SALES@ABLEELECTROPOLISHING.COM

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// THE ABLE ELECTROPOLISHING DIFFERENCE

Since 1954, Able Electropolishing has been refining its technology to improve the fit and function of metal parts. No matter whether your part is small or large or the industry you work in, our electropolishing process gives you a unique combination of benefits you won't find with other metal treatments.

Find out more at: ableelectropolishing.com



ISO 9001
ISO 13485