



Jessup Engineering meets 21st Century Challenges to the Surface Finishing Industry

by

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Looking at the surface finishing industry in the first decade of the 21st century, there are plenty of challenges - economic, environmental, technological - many of which could not be imagined when the industry was in its infancy.

Much of the progress to meet the ever-growing number of challenges has been through improvement and development of processes. Such advances include plating on light metals, alloys, plastics and other difficult-to-plate substrates. Co-deposition of particles and pulse current waveforms enabled manufacturers to create rather formidable properties on some rather mundane substrates.

Historically, there has been plenty of emphasis on the process. Nonetheless, none of this could have been possible without the means to march the workpieces through whatever process gauntlet is required - the equipment. We've come a long way from the days when all you had to do was to "hang it on a wire and dip it!" Indeed, fifty years ago advanced machine technology involved electro-mechanical relays and driven by Tenor drums or

mechanical cam controls. Programmable logic controllers and personal computers were a long way off.

Nonetheless, the creative engineers of the day did wonderful things in the area of designing and building plating equipment. Among them was a transfer mechanism at the Ternstedt Division (GM) plant in Flint, Michigan, where racks of automobile door handles were shuttled from a huge copper-dual nickel plater to another huge dual chromium unit. Another concept was an experimental closed-cell conforming anode bumper plater called the "pants presser," for Pontiac Motor Division. It never saw all-out mass production, but it might have done so with today's controls technology and materials.

The equipment available today is the result of many long years of experience and technological evolution. One company that exemplifies application of this progress is Jessup Engineering, located in Rochester Hills, Michigan. Recognizing the importance of process flexibility, Dick Jessup began his business in 1971 to develop and manufacture programmed hoist systems.

The first machine was built for a plating company in Detroit, Michigan.

Turn-key plating systems

It was a natural progression to expand into complete turnkey plating systems. As of today, Jessup Engineering has built and installed over 1,200 hoists and 600 complete machines or conversions worldwide. Machines include rack, barrel and basket configurations as well as numerous specialty applications. They have built systems to process ferrous metals, aluminum anodizing and conversion coatings, plating-on-plastics and organic finishing, including paints, lacquers and polymer coatings.

Each system is built to meet customer requirements - no two are alike. Specifications may include barrels, tanks, filters, ventilation, water conditioning, waste treatment, material/parts handling and process controls. Jessup builds each system with commercially available components to reduce cost and ease parts acquisition.



Double row push-pull ventilation

An especially important feature is ease of maintainability through open design. Jessup experience indicates a machine with double-row push/pull ventilation offers highly effective air management and reduces machine corrosion compared with enclosed ventilation.

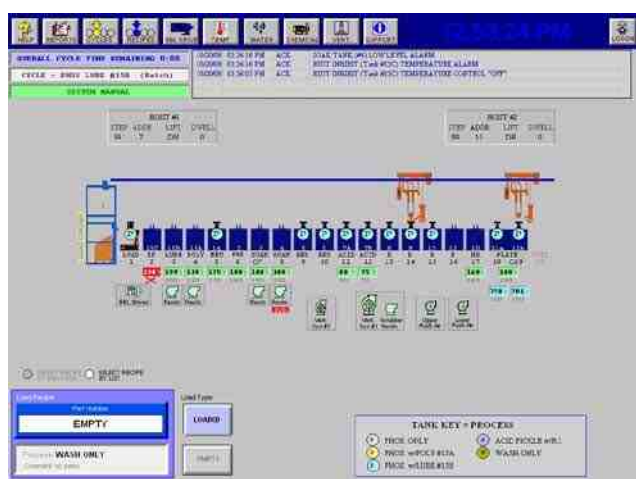
Many metal finishing processes involve rather aggressive chemistries which can wreak havoc on the tanks, hoists and other structural members. According to Tim Kurcz, Director of Sales for Jessup Engineering, the objective is to "bullet-proof" the machine structure. Components exposed to tenacious chemistries are built

of stainless steel. All other components and support structures are coated with two-part epoxy paint. Jessup machines are designed for a 35 year useful life.

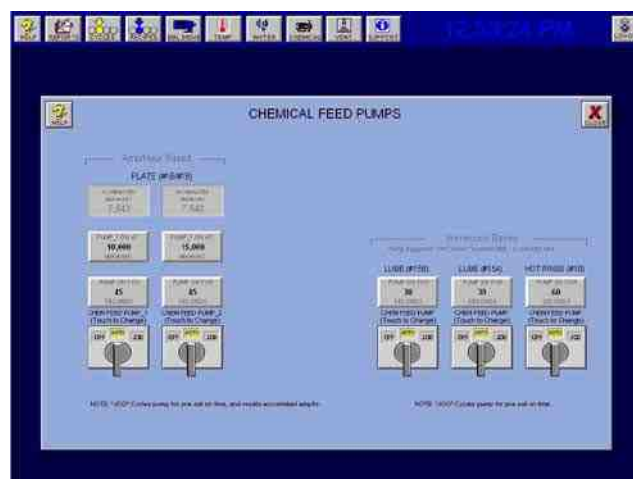
Automated process controls

The heart of these machines is a sophisticated automated control system. Advances in electronic technology allow controlling, monitoring and reporting of the entire process. Electromechanical controls have been replaced with programmable logic controllers, often driven by industrial quality personal computers. This combination recognizes bar codes for individual part recipes, adjusts machine parameters, tracks each load and records all process data.

Jessup Engineering maintains an in-house staff of electrical and mechanical designers. All machine programming is done by experienced personnel well in advance of machine startup. Jessup is known for its ability to deliver operator friendly solutions for challenging processes and motion control profiles.



Touch screen master control



Chemical feed monitoring



Temperature monitoring



Water management

Pre-engineered cycles are managed with a touch screen display interface. The central feature of the screen is an overview that displays real-time machine status. The screen shows the position of each hoist, load and process tank. Other data, such as tank temperatures, immersion times and rectifier outputs can also be displayed.

For example, an operator can access a screen which shows the temperature in each tank and rectifier output on a real-time basis.

Resource savings

With the advent of PC/PLC controls, Jessup monitors and manages machine processes based on a customer's part loading using statistical process control. Among the primary objectives in the design of these systems is to minimize the consumption of process chemicals, and water usage. The amount of water "drag out" with a rack or barrel can be surprising. Part geometry, orientation on a rack and interaction in a barrel are factors which contribute to drag-in and drag-out between tanks. Poorly positioned parts can also orient an indentation or cavity upward, allowing it to serve as a "cup," dragging liquid from a process tank unnecessarily. To assist drainage, Jessup builds tilting and tipping hoists which can be controlled by the individual part recipe.

In one application, a line was built to process large steel channels over 20 feet long. Processed in a horizontal position, they carried literally hundreds of gallons of water per rack when removed from a rinse. It would ultimately shed water from the part, but only after considerable dwell time above the tank resulting in lost productivity. The deceptively simple solution was to tilt the channels slightly during the dwell, increasing the speed of the runoff and restored productivity. Automatic rack tilting was incorporated into the hoist for this system.

Other methods of reducing water usage have been incorporated into Jessup designs. Computer controlled water conservation has been very effective, replacing continuous flow by adding rinse water only on a load-by-load basis. Jessup pioneered automatic rinse water management with a local customer where water usage was reduced by approximately 40%. Savings were multiplied as there was less waste water treatment required for rinse overflow.

Process management

When a load of parts arrives at a metal finishing shop for treatment - perhaps a copper-nickel-chromium multi-layer coating at a given thickness - there is a certain process "recipe" needed to accomplish this. Another load of parts may require the same process but a thicker or thinner deposit - all require different plate times. Yet another load may require a different process altogether - such as skip cleaner or acid - that is accomplished in the same machine.

The answer to multiple plating requirements is computer based recipe control. It extends to in-tank and on-hoist barrel rotation, rack tilt, drain dwell, immersion time, rectifier control and even tank and dryer temperatures.

Jessup controls handle up to 10,000 discrete recipes which may be processed with batch, mixed or even random scheduling. Bar code scanners are often used for part identification, machine presets and data tracking as work is shepherded through the process. Quality management is easy because a data file is captured, stored and can be exported for each individual load.

Customer demand helped evolve motion control only dreamt of a few years ago. Older style machines use single or two-



Multi-hoist return style rack line.

speed motors that often cause racks to swing or shake enough to catch a tank edge or cause a crash. Jessup has incorporated full length non-contact linear encoders and variable frequency drives to reduce the sway factor to barely perceptible levels.

Data management

Perhaps one of the more useful features of the automated controls used by Jessup Engineering is collection of process data. Indeed, the entire processing history of a given load of parts is collected, stored, and exported to a customer database for analysis and reporting. Each file includes the conditions a load experienced in process. With these records, it is possible to trace quality concerns back to each individual load, enabling effortless QS, ISO and NADCAP reporting and certification.

Process recipe management.



Cylindrical poly plating barrel.

Computer storage of process recipes becomes a reference library for future opportunities. Saved recipes may be retrieved instantly for use with current parts, or easily modified, renamed and uploaded to fit the requirements of a new job.

Jessup is known for exceptional customer service and offers lifetime e-support. It has a vested interest in assuring maximum uptime for customer machines – customer satisfaction. In that regard, Jessup includes secure internet based remote monitoring, troubleshooting and modification of customer machines at no charge.

Barrel plating advances

The Jessup preference for plating barrels is a one-piece cylindrical design. This design has demonstrated 18% better performance than polygonal types. They have been building round barrels for over 38 years, perfecting the fabrication technique to shape flat poly stock into the most productive, durable barrels available. Poly, steel and stainless steel cylindrical barrels are built to meet specific customer requirements.

Drainage is improved in part because there is less barrel surface per part when compared to segmented designs. Multiple perforation geometries, sizes and shapes are available to enhance plating performance. Proper perforation design can also deliver a significant reduction in drag-out and therefore reduced water usage.

Most new barrel plating machines optimize plating thickness and reduce material/energy cost by way of recipe-controlled individual rectifiers. Part quality and

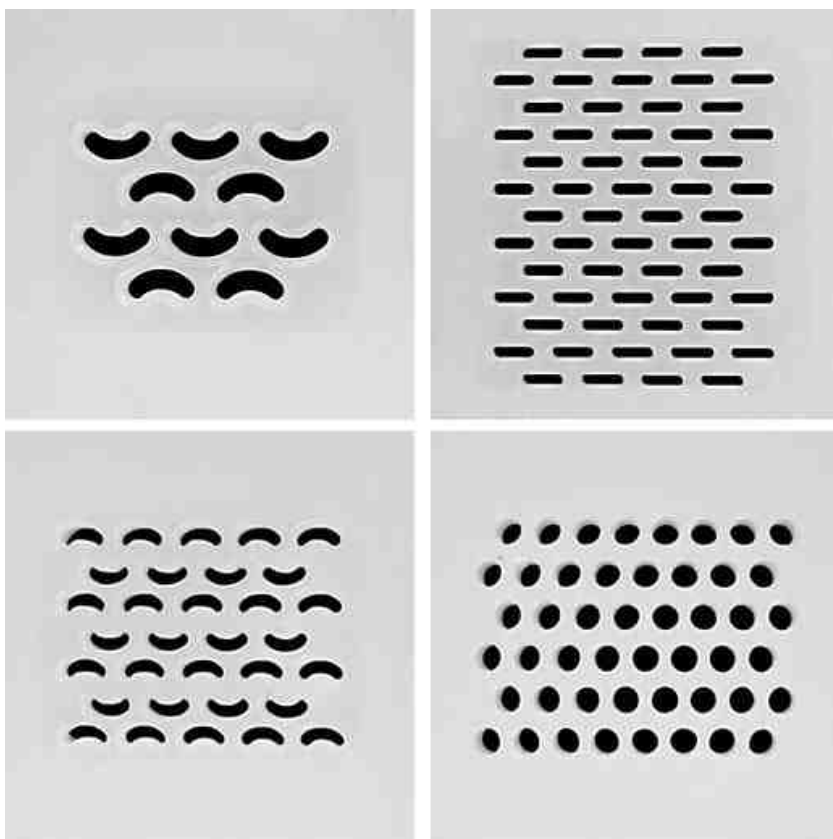
productivity is increased by means of this automatic control feature. Use of individual rectifiers in multi-cell plate tanks allows side-by-side mixed load processing as rectifiers are idled once the optimum amp-hour or current density limit is reached.

The outlook

Although the current economic situation is challenging, Jessup Engineering sees plenty of opportunity for new machines in North America. Fully automated Jessup barrel phosphate and barrel plating lines make suppliers competitive with global competitors. In these bulk processing applications, the only labor consumed is a hi-lo driver and occasional maintenance.

Likewise, retro-fitting of existing manual or automated plating lines with automated hoists and/or updated controls dramatically improves quality and throughput. Target industries are those where manual processing is affected by human variability, or where conformance to industry quality standards is now required.

The machine technology delivered by Jessup Engineering is an excellent example of how far metal finishing has come from the early days when automobiles were “dripping with chrome.” The advent of PLC controls driven by computers applied to plating, anodizing and coating systems is impressive. Integrated with modern air and water treatment technology, it’s entirely possible cars might soon “drip with chrome” again. *P&SF*



Various barrel perforations.