Electroplating as an in-house integrated production process - state of the art

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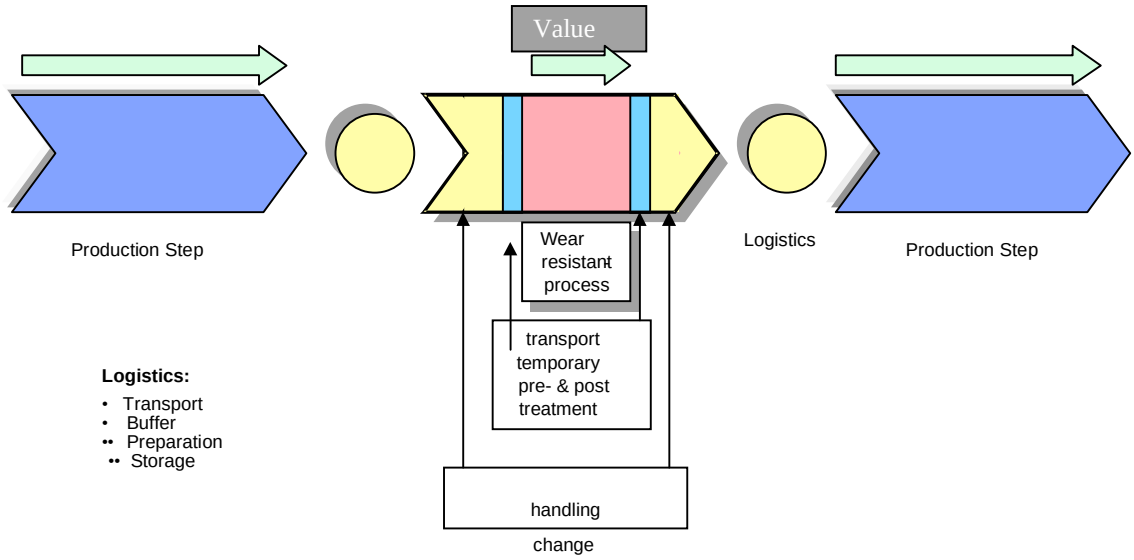
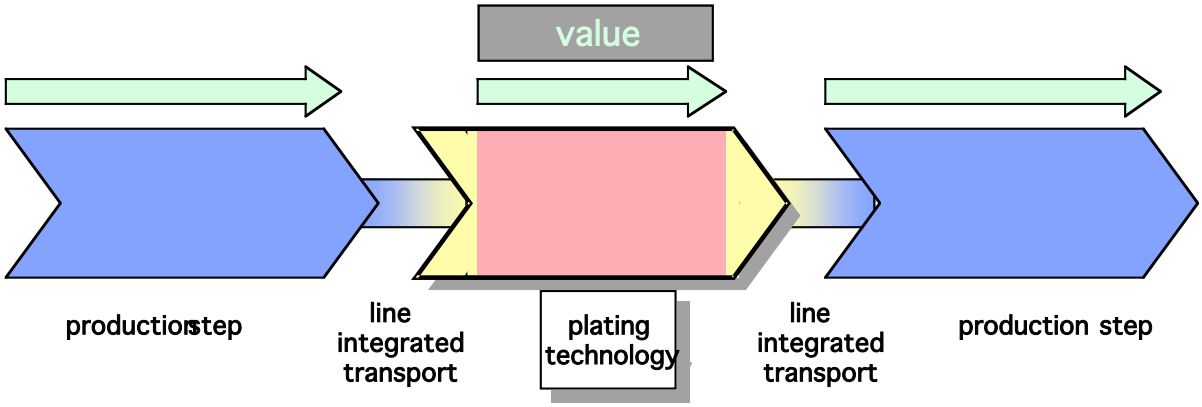
Typical surface finishes, such as electrolytic or electroless processes are implemented in different ways. Currently, the parts have to be transferred to job shops with return of the parts for final mounting or assembling. The transportation of those goods very often demands a special surface protection by oil, wax or other corrosion protection mediums that have to be removed prior to the plating process. The temporary corrosion protection, the packing and the transport can be costly or become a source of failures – e.g. incomplete removal of the corrosion protection material or of the corrosion products, scratches, surface defects.

Conventional implementation of plating processes in manufacturing



Today manufacturing sites are designed for closed production lines. Raw material and semi-finished goods are either delivered to the plant or they can be produced there directly. After mechanical machining, the parts are transported to a new reactor type of plating machines. No transport to a job shop is required as the plating machine is part of the plant area (e.g. a drilling machine or an injection molding machine). A separate, specialized plating area is no longer necessary. The plating machine is now constructed as a high speed single or multi reactor equipment. It can be fed by different medias such as pre-treatment, rinse, plating bath, rinse via pumps from a reservoir in a closed loop. There is no open access to the plating chemistry or exhaustion. The electrolyte and the rinse water reservoirs can be placed near the reactor or in a cellar. The electrolytes are especially developed or adjusted for this type of machine. The replenishment/maintenance of the electrolyte can be made in the storage tanks. As an option, the exchange of the containers and the purification of the electrolytes can be handled externally with a service company or supplier house.

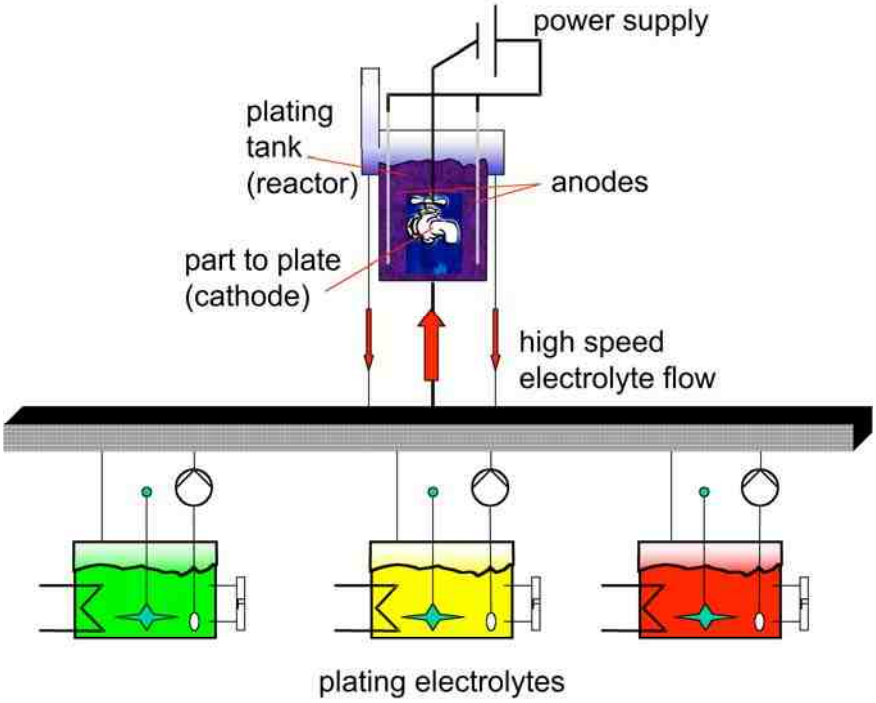
Integration of plating processes in production lines



Hard chromium plating is a good choice for this type of process because only one chromium electrolyte is necessary. It is applicable for cleaning, pickling (electrolytic or electroless), pre-dip/activation, and chromium plating. Due to the lack of transportation, no temporary corrosion protection is required as the production takes place in the same area.
An additional application is the electroplating of electroless nickel. During the SUR/FIN 2004 in Chicago on *lead-free electroless nickel plating by induction heat* we stated that the heating of work pieces by eddy currents demand such a close design inside of a magnetic coil.

Separating the electrolyte and the rinse water between working and storage tanks is not an innovation as it is already in use in strip/coil plating machines, cup platers, barrel plating machines and anodising machines. Therefore, it is logical to further develop a high speed, production-integrated machine.

High speed, production integrated machine



The transporter does not require a conventional hoist. Robots can be used. By positioning the plating steps in a circular pattern, the parts can be transported by the arm of a robot to the different reactors for pretreatment and plating.
For two years an ultra-high speed, hard chromium plating machine for cylindrical parts has been used in full production. A number of plating reactors are fed by an electrolyte circulation system with a high flow rate. The parts are remounted and removed by a robotic system. The construction allows current densities up to 1,000 a/sqdm. 1µm chromium can be plated in 1 second.

Literature

[1] Metalloberfläche 50(1996), 788; Bolch, T. und Möbius, A.; Galvanotechnik/Oberflächentechnik - Stand und Aussichten

[2] Möbius, A.; Holeczek, H. Fertigungstechnische Tage, Stuttgart, 2003
Integration der Schichttechnik in Fertigungsabläufe

[3] Möbius, A. Werner, C., SUR/FIN, Chicago, USA, 2004
Lead free electroless nickel by induction heating

