Electrolytic tinning and chromium plating lines
To meet these high demands, SMS Demag has specifically improved its process and plant technology for manufacturing top-quality products. We supply electrolytic tinning and chromium plating lines that correspond to the highest standards of quality, precision and flexibility. Exceptionally large, our product range also ensures consistent quality.

They have to offer the utmost in productivity, product quality and eco-friendly operation – today’s electrolytic tinning and chromium plating lines. These two methods of surface treatment preserve and ensure a longer service life of products. Everywhere in the world, there is a growing market for durable, easy-care goods for industrial and private use. That explains the increasing demand for corrosion-resistant and simultaneously inexpensive steel strip for numerous applications. What steel strip processors require is a sustained, constant quality level with exactly defined properties of coatings and carrier materials. Furthermore, they expect quality optimization they can promise their customers as part of their marketing claims.
Different plant concepts for different requirements of electrolytically tinned or chromium plated steel

Electrolytic chrome plating line

Electrolytic tinning line

Commons to the various types of plant is the fact that they can be adapted in stages to suit the development of the market. These extension stages are already taken into account during initial planning. During that extensive process technology is involved in electroplating, we give priority to eco-friendly and energy-saving operation of the installations, to recycling and multiple use of media, to responsible waste disposal and economical use of energy.

There is a wealth of advice and practical assistance we offer our customers throughout planning, installation and production of the plant. These extension stages are already taken into account during initial planning. Whenever you require, we will advise you from the very beginning, in planning production for the new plant, as well as informing you about alternative processes. It goes without saying that our experts team up with your personnel to take care of commissioning the entire system along with the various auxiliary equipment.

There is a wealth of advice and practical assistance we offer our customers throughout planning, installation and production of the plant. Seeing that final product is manufactured in all kinds of hardnesses and tensile strengths depending on the type of application envisaged. It can be produced in a thickness range of 0.1 to 0.5 mm and widths of 500 to 1,250 mm in various types of finish. Just like tinplate, this is made from soft, unalloyed, low-carbon steel. Here again, after cold rolling, the steel strip is cleaned, annealed and skin-passed to provide it with the required mechanical properties. The final product is manufactured in various types of finish. There is a large range within which the performance of the new plant to be installed can be adjusted to the market for tinplate. So far, SMS Demag has supplied electroplating plants with a production capacity of 350,000 tons/year and plant speeds of up to 660 m/minute.

Electrolytic chromium plating line

Electrolytic tinning line

These lines process steel strip made from soft, galvanized, low-carbon steel. First it is cold-rolled, then the steel strip is cleaned, annealed and skin-passed to give it the necessary mechanical properties.

To protect the material against corrosion it is electroplated. Known as tinplate, this is made of specially chromium plated material has replaced tinplate. It is possible to achieve plant speeds of up to 450 m/minute, tensile strengths depending on the type of application envisaged. It can be produced in a thickness range of 0.1 to 0.5 mm and widths of 500 to 1,250 mm in various types of finish.

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Combined electrolytic toning and chromium plating line

Economic considerations such as plant investments and overheads have led to a combination of toning and chromium plating lines with two completely different plating processes united in one plant. This is achieved using one of two different arrangements, with the toning process either in front of or behind the chromium plating process.

Whichever process area is not required is bypassed and the material only passes through the process stages of the plant which are equally necessary for both processes – e.g. pickling and plating.

Electrolytic toning and chromium plating

Here are the processes used for electrolytic toning, along with the appropriate electrolytes:

- Ferrostan electrolyte
- Stannous fluoborate electrolyte
- Halogen electrolyte
- Ronastan electrolyte

Most systems use the “Ferrostan” process with PSA electrolytes, but due to its advantages the MSA electrolyte, available on the market for only a few years, is gaining in importance. What makes this electrolyte more attractive is its higher conductivity. This results in lower energy costs and a flexible operating mode through a larger current density area. Largely bio-degradable, the electrolyte can also be disposed of in an environmentally friendly way.

There is a difference between one and two-stage chromium plating processes. Both create a metal chromium layer with a large current density area.

Using the two-stage process enables manufacturers to vary the relationship between the two layers. This process is usually used for thicker platings.

Depending on the application purposes of the material, various chromium electrolytes with fluoride or sulfide additives are used.

Vertical toning cells or tanks have become the preferred types for toning plants using acidic electrolytes.

It is usual to fit each tank with 4,500 AMP to 10,000 AMP rectifiers for each strip side. Plants with high rates of production (approx. 500,000 tons/year) require 10 to 15 tanks.
Individual plant components combined to create successful overall systems

Electrolytic tinning and chromium plating lines

Pay off and tensions reel units

Essential for continuous operations, two coils are provided at the feed and discharge ends. The coils are wound with or without sleeves, and lifting cars lift them onto the mandrel of the coiler. Depending on the weight of the coils, both coilers are equipped with or without manual support bearings. A changing device can be used to put on or take off the sleeves.

Loop accumulators

To ensure continuous strip travel in the process section even while the coils are being changed, vertical loop accumulators are provided. They are fitted with guide rolls and steering rolls, some of them driven, which keep the strip perfectly on track.

Tension lever

To meet today’s demands on the flatness of the finished product, a tension lever is necessary.

SMS Demag manufactures tension levers for single- and double-reduced material. They ensure excellent strip flatness through the arrangement of the bending and leveling units. Arranged in cassette form, the bending and leveling units can be changed quickly during operation. Moreover, there are bridge roll sets with a compact drive in front of and behind the tension lever, which increase and decrease the tension of the strip.

Side trimmer

Recommended for rapid width- and program-changing, as well as blade changing during operation, is a set of rotary side trimmer with two pairs of knife heads.

SMS Demag makes trimming shears with driven top and bottom knife heads for a minimum strip thickness of 0.1 mm, especially for tin plate. There is a choice between a scrap press and a scrap baller to deal with the trimming scrap. Both devices work automatically.

Cleaning section with rinse

The single-reduced material is degreased electrolytically in an alkaline solution. To clean doubled reduced material, this stage is preceded by an extra alkaline treatment.

Electrolysis then takes place with higher current densities. Degreasing is followed by cascade rinsing to prepare the strip for subsequent pickling.

Pickling section with rinse

Electrolytic pickling at room temperature is carried out to remove any corrosion residues which may be present as well as any additives from the degreasing process. That also activates the strip ready for subsequent plating.

Depending on the pickling process, both hydrochloric and sulfuric acid are used. The type of acid is matched to the coating electrolytes. It is advisable, for instance, to use sulfuric acid with PSA or MSA electrolytes.

Emerging from the pickling process, the strip is then washed in a cascade rinse.

Tension leveler

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There are recovery tanks arranged after the tinning process to remove electrolyte residues from the strip. This is effected by evaporation, so hardly any electrolyte is lost. To finish this stage, the strip is dried and marked according to the layer thickness. SMS Demag performs this process at high strip speeds of up to 660 m/minute.

Ensures an optimal, even layer distribution. To provide the electrolysis current, one rectifier for each anode stand is used in order to achieve an exact layer thickness. The rectifiers are connected to the tin anodes and the current rolls. Adjusting the current, which is calculated using Faraday’s Law, regulates the deposit of tin depending on the strip width and speed. It is an added advantage that both strip surfaces can be plated with equal or different layer thicknesses.

Tinning section

Now the pretreated strip is introduced into a vertical tinning section. SMS Demag is expert in applying the technology for tinning processes using soluble anodes for Ferrostan, fluoborate and methane sulfone electrolytes. The anodes can be handled manually or with an automated anode shifting device.

Chromium plating section

An alternative to tin-plating is chromium plating the strip. Typically of combined plant, our machines are designed in such a way that the material bypasses the tinning section to be chromium plated. They can also be built exclusively as a chromium plating line, with chromium plating taking place after strip cleaning and pickling. Then the pretreated strip is fed into the chromium plating section which also works with vertical rolls. To provide the electrolysis current, rectifiers connected to the non-soluble anodes and the current rolls are used. Adjusting the current regulates the chromium deposits that consist of chromium metal and oxide, depending on the strip width and speed. Both sides receive the same chromium plating thickness. Emerging from the chromium plating tanks, the strip is cleaned of chromium residues in a cascade rinser. Finally, the strip is dried and fed into the electrostatic oiling stage.

Inductive melting

Melting with high-frequency induction coils offers the advantages of better efficiency and therefore lower energy costs, prevention of surface imperfections (woodgrain) and flexible operation when layer thickness and strip speed change.

The strip is quenched in a water tank after melting. For some products melting is not required.
makes the exit accumulator and winding group in the preceding line superfluous, but it also means the shearing line limits the speed that can be achieved in the process section.

Fitted with three to four stacking units in which the various grades can be stored and forwarded. However, if the entire material is to be processed into panels, the shearing line can be coupled to the preceding coating line. That makes the exit accumulator and winding group in the preceding line superfluous, but it also means the shearing line limits the speed that can be achieved in the process sections.

Now available are a strip thickness measuring device and a hole searching device to check and ensure an excellent surface quality. This is achieved, even at high process speeds, thanks to the automatic surface inspection system. Added to this is a camera system installed along the inspection route.

To protect the tinned surface, the strip is treated electrolytically or in an immersion process with a sodium dichromate solution. Called passivation, this stage is followed by washing and drying.

Now the measuring devices inspect the strip to determine its thickness and to detect any tiny holes. Then dividing shears or rotary shears cut the strip into panels, ready for stacking. The sorting and stacking system is fitted with three to four stacking units in which the various grades can be stored and forwarded.
Worldwide references