The Coil Coating Process

The process of coil coating is the continuous painting of a coiled metal substrate. The process is accomplished in seven or eight perpetual steps.

Step 1 - Coil Entry

The entry end of a continuous coating line includes two coil decoilers, a coil splicing unit, accumulation tower, and a method of coil tracking.

Mill finish coil is unpackaged and inspected for accurate width, thickness, and flatness specifications. The mill finish coil is then placed onto one of the two decoilers for entry into the coating line. The head of the new coil is spliced to the tail of the running coil. Spicing one to the other is accomplished by the utilization of the accumulation tower. The accumulation tower carriage advances downward stopping the tail of the running coil at the splicing unit. The accumulation tower carriage accumulates enough of the running coil that the operator has approximately forty-five seconds to make the splice. Once the splice is made, the carriage is raised and the line returns to its normal running position.

Step 2 - Cleaning of the Coil

After the coil exits the entry accumulation tower, it will enter a series of cleaning and rinse tanks. This section of the process is often referred to as the wet section. The cleaning tanks are designed to clean the strip using a series of sprays applying cleaner to both sides of the metal as it passes through the tanks. After cleaning the metal, it then passes through multiple rinse tanks to assure that all cleaner residue is removed. Proper cleaning procedures are extremely important to the coil coating process, when metal is not cleaned properly, paint adhesion problems will occur.

Step 2 - Chemical Pre-Treatment

The chemical pre-treatment or conversion coat step of the process provides a protective layer to the substrate. This chemical treatment is designed to react with and modify the metal to produce a surface suitable for painting and to enhance paint adhesion. This conversion coat also provides protection to the substrate from exterior corrosion.

As the strip continues moving forward from the final rinse tank, it is air dried and moves into the chemical coating section. Most coil coating lines apply the chemical treatment in one of two ways. The first method would be to pass the strip through a spray or dip tank. The second, and most environmentally safe method, is using a chemical coater.

In using a chemical coater for this part of the process, the strip passes through a coating machine, which applies a thin layer of chemical film to the strip. The chemical coating machine consists of a series of rolls that support the strip through the machine and utilizes a pick-up roll and a rubber applicator roll to apply the chemical to the strip.

After exiting the chemical coater, the strip moves directly into a drying oven which dries the chemical treatment and eliminates any moisture from the strip.

Step 4 - Application of Paint

The application of the paint to the chemically treated metal is accomplished by passing the strip through the paint roll coater. The paint roll coater consists of a series of rolls that support the strip through the machine and uses a paint pick up roll and a rubber applicator roll to apply the paint to the strip. As the strip passes through the paint roll coater, paint is being applied to both sides of the strip simultaneously.

Proper coater roll settings and speeds must be monitored for accurate application of paint film. The correct paint film will vary depending on the specification of each individual paint or paint standard. Before any paint is used in the paint roll coater, it must be properly mixed to achieve the specified application temperature and viscosity.

Step 5 - Curing of the Paint

After the paint has been applied, the continuous strip then moves directly into the curing ovens. The curing ovens are generally natural gas fired ovens that achieve temperatures of six to eight hundred degrees. The oven temperatures must be set at levels to achieve a peak metal temperature (PMT) specified by the coating's supplier for a specific paint and line speed. With the proper paint film thickness, line speed and peak metal temperature achieved, the curing step is complete.

NOTE: Steps four and five describe the application of a single coat finish. The application of a primer coat before the finish coat would describe a tandem or two coat coating line.

Step 6 - Cooling the Strip

The painted strip moves directly from the curing ovens to the water quench or cooling section of the line. The cooling section of the continuous coating line is a tank with a series of upper and lower water sprays. The purpose of the water sprays is to cool the cured strip, so recoiling of the continuous strip can be achieved.

Step 7 - Recoiling the Strip

The exit or recoiling end of the continuous coating line is made up of the exit accumulation tower, a shear unit, two coil recoilers, and a method of coil tracking.

As the coated strip exits the cooling section, it moves directly into the exit accumulation tower and to one of two recoiling units. When a splice moves toward the recoiler, indicating the end of one coil and the beginning of a new coil, a cut must be made to start the new coil on the second recoiler. This is accomplished by utilizing the accumulator to provide enough strip to avoid shutting down of the line to make the cut and start the new coil on the decoiler.

Once the new coil is started, the completed coil on the opposite recoiler is removed. A sample of the completed coil is taken to the quality lab for testing and then sent to packaging.