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© *Chemical Coatings in
Galvanize Lines*

Application of Passivation and Chemical Coatings in Galvanize Lines

With the demand to achieve more consistent, higher quality passivation and chemical coatings on galvanized strip while controlling costs, reducing scrap, sludge and warranty issues, a need has developed for a more controllable means of application.

Companies operating galvanize lines today are experiencing severe competition and are continually being put under the gun to deliver a higher quality product, and as part of this quality push, the need is arising to deliver a coated product that is not only protected against corrosion during transit and storage, but also one that is prepped for post galvanizing operations, such as forming, stamping, and finishing. Their customers want a quality product that can go directly to forming, fabrication, and finishing without a lot of additional processing steps.

The protection I speak of is to protect the galvanized strip against "White Rust" that can damage the physical surface and appearance. The other coatings that are applied are anti fingerprint acrylics, color tinted coatings and various pre-paint and primer coatings. The typical coatings consist of Non-Chrome, Chromates, phosphates, acrylics, primers, and dried in place lubricants.

The typical method of applying most of these coatings has been (or is) the "Dip" process where the coil passes submerged through a dip tank and then, when exiting the tank, the strip passes through a set of pinch, or squeegee rolls to distribute and remove the excess coating. Another method of application that is widely used is the "Spray - Squeegee" system where the coating fluid is sprayed onto the surface through a series of nozzles, and then like the dip process, passes through a set of squeegee rolls to distribute and remove the excess coating fluid (see Fig. 1).

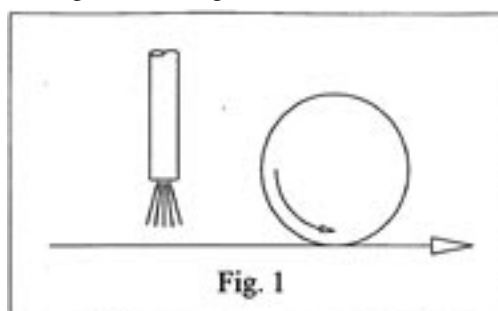


Fig. 1

The dip and the spray squeegee equipment and methods of application are inexpensive to build install and implement, but it is very difficult to control the amount of chemical being applied, and extremely difficult to get uniform and consistent coatings from edge to edge over long runs. These methods usually

will result in chemical waist, poor quality of applied coatings with skips, streaks, and inconsistent film thickness on the strip. In addition to these problems, there are also health issues with the spray-squeegee systems due to the tendency of the chemicals to become airborne when atomized, and depending upon the chemicals used, can be very hazardous to the environment and workers in the area.

Applying Chemicals Using Roll Coaters

Roll Coaters, or as commonly known in the industry, Coil Coating Machines, are beginning to appear in the galvanize lines for the successful application of passivation and chemical coatings. Some of the benefits and advantages of Coil Coater application over the spray - squeegee application are as follows:

Roll Coater Advantages

- Consistency of Coating Weight over entire Coil (Length and Width)
- Better edge coating control
- No streaking
- Precise control of coating weight over wide range of line speeds
- Fast, controlled engage / disengage of process
- Easy cleanup
- Fast Roll Change
- Elimination of sludge caused by spray system (Elimination of hazardous waste)
- No airborne Chemicals (Health benefit)
- Quiet operation

The Process of Coil Coating (Roll Coating)

The coil coating process achieves success by the ability to precisely control, or meter the correct amount of fluid to be coated onto the coil as it passes through the coater. In the case of a "Chemical Coater" in a galvanize line, the metering of the chemical to be coated is achieved by use of a pickup roll that picks the chemical out of a reservoir, or in this case, a coating pan, and depositing the chemical on the applicator roll, which in turn, applies the coating to the moving strip (Fig. 2).

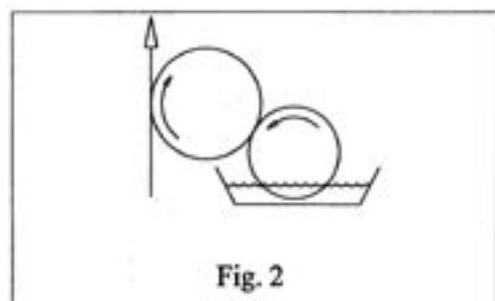


Fig. 2

The amount of coating being applied to the strip, or coil, is controlled by the coil coating machine in three ways. First is to control the amount of fluid being transferred is the speed at which the pickup roll is rotating. The faster the pickup roll turns, the more coating fluid will be transferred to the applicator roll. Second is to control the amount of coating being transferred and applied to the strip is by rotating the applicator roll faster or slower. The applicator roll brings the coating fluid into contact with the strip, thus causing more or less chemical to be applied to the strip. The third method of controlling the coating weight is by changing the pressure between the pickup roll and the applicator roll. More pressure between these two rolls generally means that less coating fluid will pass between them, and less coating will be transferred to the strip. For extremely fine control of coated film weights, a combination of these adjustments will be made by employing various roll speeds and pressures.

Another way of coating and controlling the applied film thickness is to use either a "Forward" or "Direct" method of coating. In the "Forward" mode of coating, the applicator roll turns with the strip (in the same direction as the strip – Fig. 3), while the "Reverse" mode of coating has the applicator roll turning against the strip (in the opposite direction as the strip – see Fig. 4).



Forward Coating

Reverse Coating

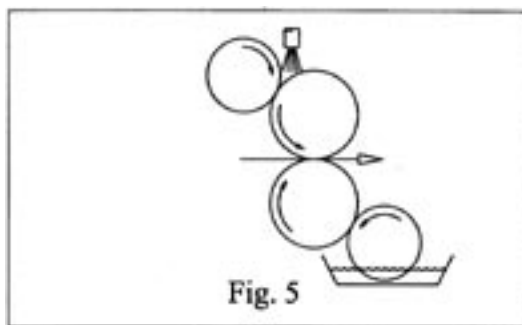
The "Forward" mode of coating normally applies thinner coatings, and is generally used in galvanized lines for thin fluid coatings like Chromates and phosphates. Coatings applied in the "Reverse" mode normally have more body or a higher percentage of solids content and the applied film weights are generally heavier. The "Reverse" mode also produces a smoother finish due to the "Shearing" effect of the coating when being applied to the strip. The "Reverse" mode is generally used on acrylic and finish paint coatings.

Types of Coil Coating Machines (Roll Coater Configurations)

The type and configuration of the Coil Coating machine to be used for a specific application depends upon the coating to be applied as well as the line layout and available space. To begin with there are three basic types or configurations of coaters to be considered. They are the "Horizontal Coater", the "Vertical Coater" and the "S" Wrap Coater. We will now explore the geometry and the advantages and disadvantages of each of these coater types.

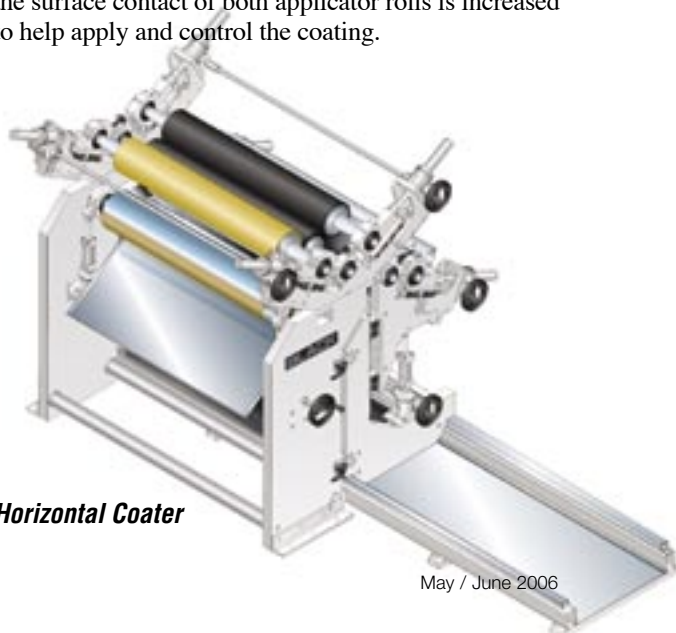
Horizontal Coater

The "Horizontal Coater" is configured for coating one side or both sides of a strip as it passes through the coater horizontally (Fig. 5).



Horizontal Coater

The "Horizontal" Coater gets its designation from the path that the strip takes as it passes through the coater. In the case of the Horizontal Coater, one head is above the strip and one head is below the strip. The two heads are slightly offset one from the other so that the surface contact of both applicator rolls is increased to help apply and control the coating.



Horizontal Coater

Horizontal Coaters generally use a “Nip” feed for the topside head due to limited space, and use a “Pan” feed for the bottom head. To keep the coating fluid circulating and clean, it is pumped into the nip between the rolls in the top head, with the excess flowing from the top head down into the pan for the bottom head. All remaining, unused fluid is re-circulated back to the chemical supply tank where it is remixed, filtered and returned to the coater.

The bottom head of a Horizontal Coater can be configured to roll out from under the strip for ease of clean up, job change and roll removal. The top head is usually fixed in place, but can also be made removable. Great care must be taken when operating the horizontal coater because of the proximity of the strip to the topside head.

Advantages:

- Low Cost.
- Small foot print (in line space requirements).
- Coater fits into existing horizontal pass line of strip.
- Easy to change rolls and clean up bottom head.

Disadvantages

- Difficult to change rolls and clean topside head (Close to strip).
- Difficult to see topside and bottom side of strip while coating.
- Gravity can adversely affect the flow of coating onto bottom side of strip.
- Difficult to access and walk around coater.

Vertical Coater

The “Vertical Coater” is configured for coating one side or both sides of a strip as it passes vertically through the coater (Fig. 6).

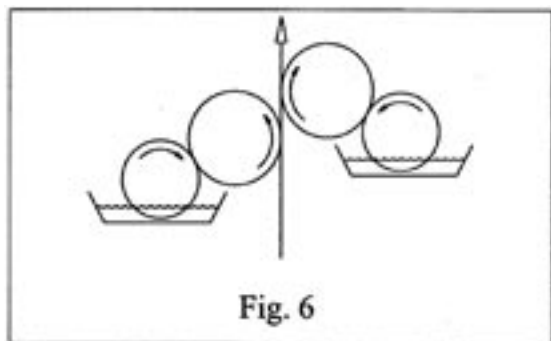


Fig. 6

Vertical Coater

Vertical Coater gets its designation from the path the strip takes as it passes through the coater. In this case the strip travels horizontally in an upward direction through the coater. The vertical coater has two heads opposing each other, both of which are mirror images of each other. Like the horizontal coater, each head is offset at the applicator rolls so that a slight “S” wrap is created over the applicator rolls to provide better control when coating. The coating fluid is pumped into the coating pans for each head where it freely circulates through the pans with the excess flowing through overflows back to the chemical supply tank where it is remixed, filtered and returned to the coater.

Advantages:

- Moderate Cost.
- Easiest of all coater configurations to operate.
- Unobstructed view of top and bottom heads and of strip being coated.
- Gravity does not adversely affect one side more than the other.
- Easy to change rolls and clean top and bottom heads.
- Easy access around entire coater.

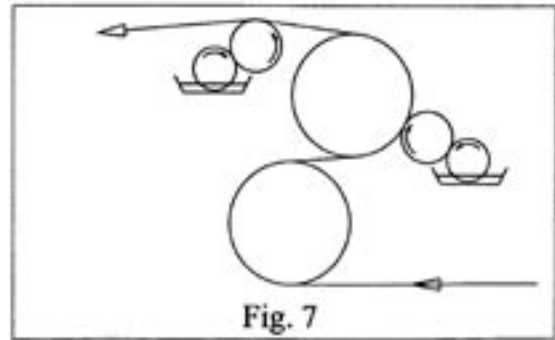
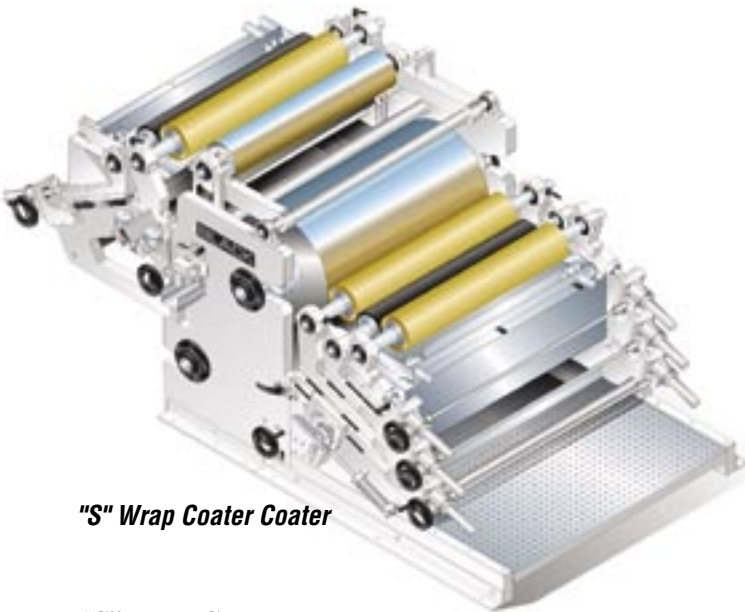
Disadvantages:

- Costly installation (Requires vertical tower structure for coater and dryer).
- Requires strip diverters to go from horizontal pass to vertical pass, back to horizontal.
- May require protection under coater to prevent spills going down vertical strip.

“S” Wrap Coater

The “S” Wrap Coater is configured for coating one side or both sides of a strip as it passes horizontally through the coater (Fig. 7, pg. 11).

The “S” Wrap Coater gets its designation from the path that the strip takes when going through the coater. It actually travels through the coater in an “S” pattern, starting at the entrance into the coater at floor level, where the strip enters the coater horizontally, then travels up around the deflector roll and up over the backup drum, and then exits the coater horizontally into the drying oven.



"S" Wrap Coater

"S" Wrap Coater

The topside coating head is located adjacent to the backup drum on the entry side of the coater, and the bottom side head is located under the strip at the exit of the coater.

The 'S' Wrap Coater, like the Vertical Coater uses coater pans and pickup rolls for the conveyance of the chemical to the applicator roll and onto the strip. The coating fluid is pumped directly into each pan, where it is kept circulating, with all remaining, unused fluid being re-circulated back to the chemical supply tank where it is remixed, filtered and returned to the coater.

Advantages:

- Coater fits into existing horizontal pass line of strip.
- Easy to see topside and bottom side of strip while coating.
- Easy to change rolls and clean up heads (with roll-out bottom head).
- Easy to access and walk around coater.
- Tends to flatten strip bow when coating.

Disadvantages:

- High Cost.
- Larger foot print (More in line space requirements than other configurations).
- Gravity can adversely affect the flow out of coating on the bottom side of strip.

Reliable, Controllable Coating Methods

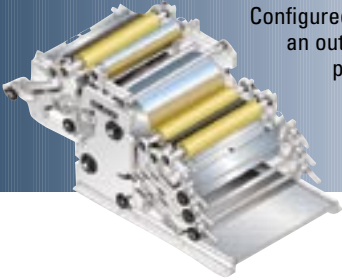
- Quality, cost and environmental concerns are creating a need for more reliable and controllable coating methods. Coil Coating (Roll Coaters) are now replacing dip and spray squeegee methods for the application of chemicals in galvanize lines.
- There are basically three types of Coil Coating machines used for the application.
- Each configuration has specific advantages and disadvantages.
- The Horizontal Coater is the least expensive of the three types.
- The Vertical Coater is the most user friendly and is moderately priced, although may be highest price depending upon vertical tower structure requirements.
- The "S" Wrap Coater is the most expensive and is used for the highest quality requirements. 🌐

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from Design to Finish!

Black Bros. proudly announces their new line of coil coating machines. Ideal for pre-paint chemical coating – including phosphate and chromate – as well as for prime and finish paint coatings. A full line of film-to-coil laminators is also available. You'll benefit from our extensive R&D experience and innovative coating solutions, plus tech & field support anywhere in the world.

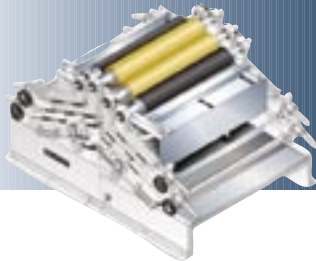
"S" WRAP COATER



Configured with 2 or 3 roll coating heads, here's an outstanding performer for prime or finish paint coatings, or when engineered for printing operations. Shuttle head options provide quick color change.

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Ideal for limited floor space, add the innovative Fast Change and Shuttle Head options for quick coating change and off-line cleanup.



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BLACK BROS. CO.
501 Ninth Avenue P.O. Box 410
Mendota, IL 61342-0410

Phone: 815.539.7451
info@blackbros.com
www.blackbros.com



Company Description:

Black Bros. Co. is a leading designer and manufacturer of roll coating and laminating equipment with over 100 years experience covering a broad range of industrial applications. Coaters can be configured for chemical or paint applications in various style coaters, including S-wrap, horizontal or vertical coaters, as well as an innovative "fast change" coater. A full line of laminators is also available from Black Bros. Co. Regardless of your application, Black Bros. Co. provides worldwide technical and field service from five locations, along with excellent parts availability. Demand Black Bros. quality, dependability and performance in your next coating line.

Statistics

100 Employees, 4 US locations, 1 International location.

Products

'S' Wrap Coaters, Vertical Coaters, Horizontal Coaters, Laminators, Quick Change Systems

Recent Developments

The introduction of a new family of coil coating and laminating equipment.

Clients/Markets Served

Coil Coaters and Service Centers Worldwide.

Key Personnel:

Matthew B. Carroll
President and CEO
Frank Kobilsek
Product Development

Company Contact Information:

Black Bros. Co.
501 Ninth Avenue
P.O. Box 410
Mendota, IL 61342
Phone: 815-539-7451 Fax 815-538-2451
Email: info@blackbros.com
www.blackbros.com
Manufacturing, Sales and Service