



## GALVANIZING LINES – WET FLUX GALVANIZING

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**THE BRONX GROUP**

'Wet Flux' galvanizing is a viable process for the production of a quality galvanized product in the market place. Without the complexity and cost of a large Non Oxidising Furnace and associated expertise to run and maintain such equipment, Wet Flux lines can fit the requirements of: 1) Entry level introduction into galvanizing lines. 2) A niche level of production output to meet demand. 3) A versatile line capable of a large range of products

Wet Flux lines can also include in-line tension levellers to achieve high standards of strip shape and these can also be coupled with a Surface Conditioning Mill which allows flattening of the zinc spangle to a level required for continuous painting lines.

With all processing, a quality product is the result of good equipment and good process control which, when coupled with good incoming strip allows premium performance to be achieved for zinc coating control.

### WET FLUX POT AREA





## THE WET FLUX PROCESS

The principles of Galvanizing are the same whichever production method is used. A clean oxide free cold strip has to be presented to the zinc pot at a temperature suitable for achieving an adherent bond between the steel strip and the coating.

A wet flux line incorporates an alkali cleaning section and an acid etch section to clean the strip.

### ALKALI CLEANING

Two alkali cleaning tanks are provided followed by a hot water rinse and strip drying. The alkali can consist of a simple dunk tank going through to a high pressure spray system depending on production speeds and product needs. With a control temperature of 60-70°C the first tank provides an effective method of heating the strip and the second tank provides an effective method of removing protective oils and dirt from the strip. Rinsing and drying then presents a clean dry strip into the accumulator tower to enhance tracking.

### ACID ETCHING

A tank containing 5-15% Hydrochloric acid is then used to ensure the removal of oxide from the strip. Often strip 'black' from Iron fines can be seen exiting this tank bright and shiny. This etching process prepares the strip for the zinc coating to form a very strong bond to the steel.

### HEATING THE STRIP

Heating the strip consists of preheating, fluxing and then via immersion within a lead layer within the pot to bring it to the required coating temperature.

### PREHEATER

A gas fired preheater is normally used to bring the strip to 150-200°C. Open to the air at this temperature no detrimental oxide is formed. The preheater provides several benefits to the wet flux pot.

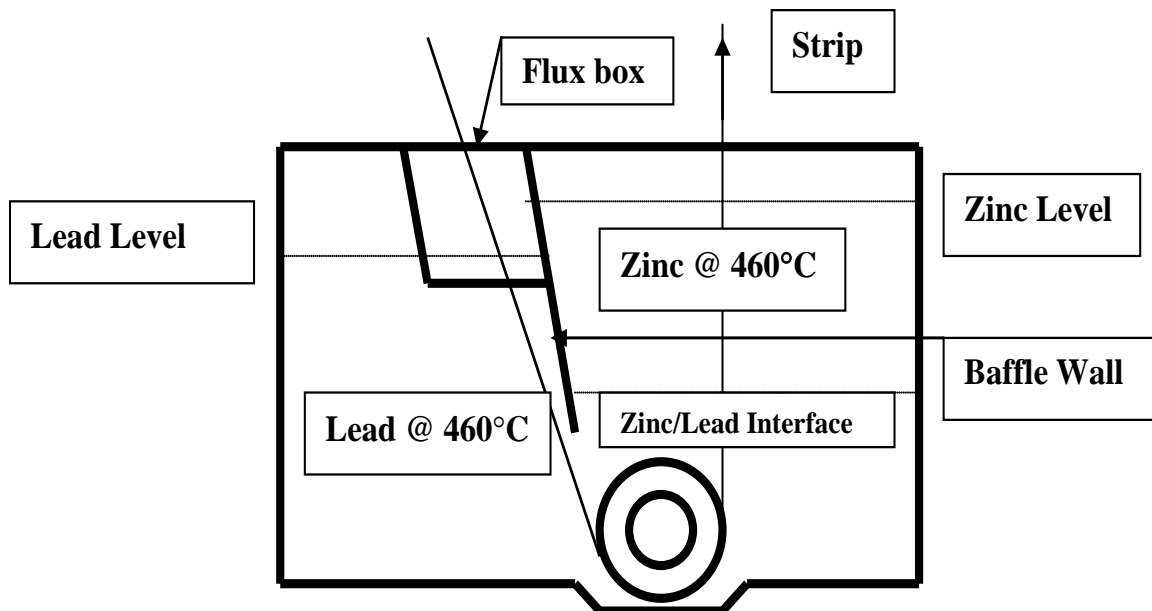
- a) The incoming heat of the strip increases the thermal capacity of the process
- b) The heat also allows a better transition into the Lead



## FLUX

A layer of molten flux around 200 – 300mm in depth sits on top of the lead layer within a 316L stainless steel box. This flux is an active solution which provides the final cleaning of the strip before it enters the molten metal. Any light oxide developing after the etching section on the strip is removed at this stage.

## THE WET FLUX POT



### Schematic cross section of the Wet flux pot.

**Molten Zinc floats on molten Lead. A baffle wall separates the Zinc from the incoming strip. From the preheater the strip passes through a molten flux picking up heat in the Lead. This allows the strip to reach the required temperature as it enters the molten Zinc.**



A low carbon steel pot is combined with a stainless steel baffle wall and flux box. A protective layer of stainless steel is welded onto the pot lining where it contacts the zinc to provide protection from the aluminium within the zinc mix. The pot is heated via a gas fired heater with the lead absorbing the heat to both heat the strip to the required level and maintain the molten zinc at the required temperature.

Zinc is the metal that provides the steel surface protection, amounting to approximately 98% of the coating. The aluminium is used to provide flexibility to the zinc coating so the galvanized strip can be bent and formed during later processes without the zinc cracking or peeling off the steel strip. Antimony and tin are used to provide aesthetic characteristics such as spangle size and shine.

The process of galvanizing is a complex one and all operating parameters must be maintained correctly at all times. The key operating parameters include:

- Metal temperature controlled between 450 – 460°C
- Correct volumes of each metal in the Pot
- Correct line speed for Thermal Capacity
- Continuous removal of Dross from the molten zinc surface
- Controlling the Air Knife system to ensure the correct amount of zinc is deposited onto both sides of the strip

## POT CHEMISTRY

The wet flux process always provides a spangled surface. The brightness and size of spangles can be managed using various alloys. Producing a smooth spangle free from spangle boundary relief is an aspect that Bronx specialises in. Of course coating mass is still the major influence over the relief within the spangle. Below a coating mass of 150 grams per metre squared a smooth coating can usually be achieved.

Maintaining the correct chemistry within any pot is critical in producing a consistent quality product. The maintenance of aluminium levels is critical in ensuring good coating adherence and a pot free from bottom dross. Having the required analytical equipment to measure and maintain aluminium and other alloying elements within the pot is an investment in maintaining quality and prolonging the life of the pot.

## POT EQUIPMENT AND COATING CONTROL EQUIPMENT (Air Knives)

Photo A in this article shows the pot equipment typical of any strip galvanizing line. A 316L stainless steel sink roll is combined with 2 deflector (stabiliser) rolls which provide the ability to hold the strip in



position as it passes through the air knives. The top deflector roll sets the strip position (pass line) through the knives.

The Coating Control Equipment controls the weight of zinc that is deposited onto the steel strip. The strip leaves the zinc layer in the Pot, in a vertical passline. As the strip drags a lot of molten zinc with it, far too much for commercial use, Air Knives are placed either side of the strip immediately above the molten metal. The Air Knives blow a high pressure stream of air onto the strip, removing excess amounts of zinc from the strip. The excess zinc returns to the zinc layer in the pot. There are several controls associated with the Air Knives that the operator can adjust to give the best product for the particular specification. The variables include:

- Air pressure to the Knives
- Distance the Air Knives are horizontally away from the strip
- Distance the Air Knives are vertically above the molten metal
- The angle the Air Knives are directed onto the strip
- The size of the Lip Gap through which the high pressure air is blown onto the strip.

The Air Pressure/Flow for the Air Knives is provided by a high pressure blower driven by an electric motor.

Centrifugal blowers are sized to meet the requirements of the customer in terms of production rates and coating requirements.

The opening picture also shows a set of 'touch rolls' being used to assist in maintaining the strip central through the air knives. These rolls allow the strip to be held tighter and flatter as the strip passes through the air knives. This then allows the air knives to be positioned closer and parallel to the strip resulting in a smoother more uniform coating with the desired coating mass.

## **THE NEXT STEP TO PRODUCE A QUALITY PRODUCT**

Market/customer demands are always increasing and being a preferred supplier also requires flexibility. Two pieces of equipment are successfully being used by our customers to meet these requirements.

## **TENSION LEVELLER**

The Tension Leveller is an essential piece of equipment to meet the high standards of flatness being demanded. For annealed product used for forming, it is essential in providing a product free from fluting.





A 3 stage leveller is sufficient for an annealed or commercial quality product while a 4 stage leveller is provided for full hard products. During commissioning of this equipment an operational matrix is developed. Once developed, only minor adjustments are normally required to ensure consistency in the levelling process.

## **SURFACE CORRECTION MILL**

Bronx has developed a 6 high mill which is much smaller and less costly than the 4 high mills seen within large galvanizing operations. This equipment provides the essential requirement for smoothing the zinc spangle to achieve a superior surface for post painting applications.

This equipment provides great flexibility in the operation. The changeover from producing a standard galvanizing product to a product suitable for painting is as simple as applying the mill.

Together the tension leveller and the mill provide the ability to produce a high quality product for post painting operation.



***A MILL AND LEVELLER COMBINATION***



***GALVANIZED COIL FROM A BRONX WET FLUX LINE***

Wet Flux galvanizing is an economical choice for achieving a quality galvanized product. The combination of proven technology and equipment delivers the desired outcome.

To ensure a quality product is achieved, analytical testing equipment to measure and maintain the pot and process are a necessary investment.

# THE BRONX GROUP



A galvanizer's success is directly related to the quality of the cold rolled feed and good quality equipment. Good quality feed means optimum coating control at the pot, with quality air knives ensuring the right amount of zinc coating goes on the strip and the excess zinc is returned to the pot.