THE BRONX GROUP

TENSION LEVELLING SOLUTIONS

Enhancing ferrous and non-ferrous metals with quality equipment and customer-focussed solutions

www.thebronxgroup.com

The Bronx Group

TENSION

Celebrating 85 years of providing high quality coil processing solutions, The Bronx Group of companies continues to remain a trusted specialist across the globe. With regards to our tension levelling solutions, Bronx can provide a machine which can be retrofitted into a line, as well as a tension levelling line, dependent on your business requirements.

Firstly, it is important to understand coil shape correction and the difference between flattening, multi-roller levelling & tension levelling. Coil-set is often induced into strip when it is wound onto a mandrel to form a coil.

This longitudinal curvature becomes apparent when the coil is unwound at the next process and is simply removed by threading the strip through a flattening machine, comprising large offset rolls to reverse bend the strip. However, the strip may have other shape defects apart from coil set & these can only be corrected by using a levelling machine.

Bronx Tension Leveller Section

Strip Levellers

Bronx manufactures two types of strip leveller: Precision Multi-roll leveller and Tension leveller.

Precision multi roll leveller
This comprises upper & lower banks of driven rolls which are sized to suit the strip parameters.

It progressively reverse bends the strip in the upward & downward directions as it passes through the machine and produces level strip suitable for shearing into flat stackable sheets.

It can correct defects such as coil-set, cross-bow, coil twist, centre buckle, loose or wavy edges.

However, it does not totally remove the residual stresses within the material which can be an issue if the material is to be slit along its length or formed in later processes.

Tension Leveller
The tension leveller is located between an entry & exit bridle which raises the strip tension through the leveller & forces the strip to take a much tighter path as it bends around each set of work rolls.

It can correct all the defects possible with a precision leveller but can also correct camber. Most importantly it removes all residual stresses by a combination of controlled elongation & bending.

Tension levelling material has optimum flatness and stability of properties making it suitable for subsequent cutting & forming processes without risk of distortion. These distortions primarily occur due to internal residual stresses.

LEVELLING

Why Use Tension Levelling?

The tension levelling process is used to:
Correct shape defects in metal strip that has been induced by upstream rolling processes, as well as alter and improve inconsistent mechanical properties within the strip. Inconsistent shape can be present in many ways - centre buckle, wavy edges or camber, or a combination of these defects:

Wavy Edges
This is caused by the edges of the strip buckling while the centre part is flat.

Centre Buckle
Occurs when the edges of the strip are flat and the centre is buckled.

Camber
May be observed when the strip is laid on a flat surface and is not straight in a longitudinal direction, i.e. one edge is longer than the other.

A tension leveller effectively combines the design know how used for both roller levellers, and stretch levelling.

Four High Cassette

Bronx Tension Leveller Installation

Bronx levellers are now built to effectively level thin, full hard steel strip, which is an increasing requirement for building products produced in galvanising lines.

Examples of Bronx tension levelling machines can be seen in many parts of the world operating on Ferrous and Non - Ferrous materials from 0.15 mm to 3 mm thickness, and at line speeds up to 300 metres/minute (985ft/min). This has been made possible by selecting the right combination of design data for strip tension, elongation, work roll diameter and angle of wraps.

The flatness quality obtained and the overall reliability of the machines has been excellent. Our machines are durable and reliable, and very simple to operate.

BRONX

The Levelling Machine

Over time, Bronx engineers have developed computer software which enables the optimisation process to be quickly completed, with the most important single function being to reduce the bridle powers to both reduce the initial equipment purchased cost and the ongoing running cost of the equipment.

Once the inputs of strip width and thickness, material yied strengths, ductility of strip and maximum speed of the line are processed, key items of the levelling machine can be finalised.

Following establishment of parameters (work roll diameter, roll geometry, amount of elongation required), the maximum strip tension is calculated which enables bridle powers to be established.

The tension levelling machine is then configured, with the options being:

- 4 high x 3 module (2 levelling and 1 decurve module) for general purpose levelling.

- 6 high x 3 module (2 levelling and 1 decurve module) for high surface finishes - polished stainless steel, automotive skin panels, aluminium.

- 6 high x 4 module (2 levelling and 2 decurve modules) for superior surface finishes and for strip requiring no set after levelling.

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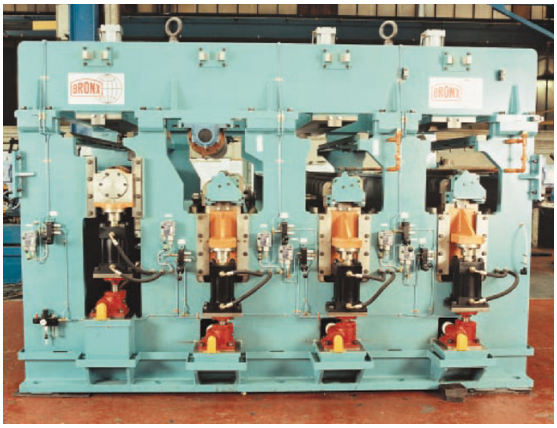


Leveller with 2 Work Modules and 2 De-Curving Modules

Having designed and built many successful tension level lines using various types of elongation control, after extensive evaluation Bronx has settled on supplying the all-electric bridle drive system.

The benefits of the all-electric bridle drive system:

- Simple to use, as it does not require any gear changes, thus ensuring your line continues seamlessly without interruptions.

-Ability to configure different bridle roll diameters to optimise control of tension distribution within the bridle.

- More efficient at correcting shape, as changes can be immediately adjusted by the operator to suit changing production requirements, which is not possible with mechanical systems.

- Easier to maintain and service long term.

In summary, tension levelling is used to correct bad shape and produces flat strip, skin passing is used to improve the mechanical properties and provide a smooth surface .

Tension Leveller with In-Line Installed in a continuous Galvanizing Line

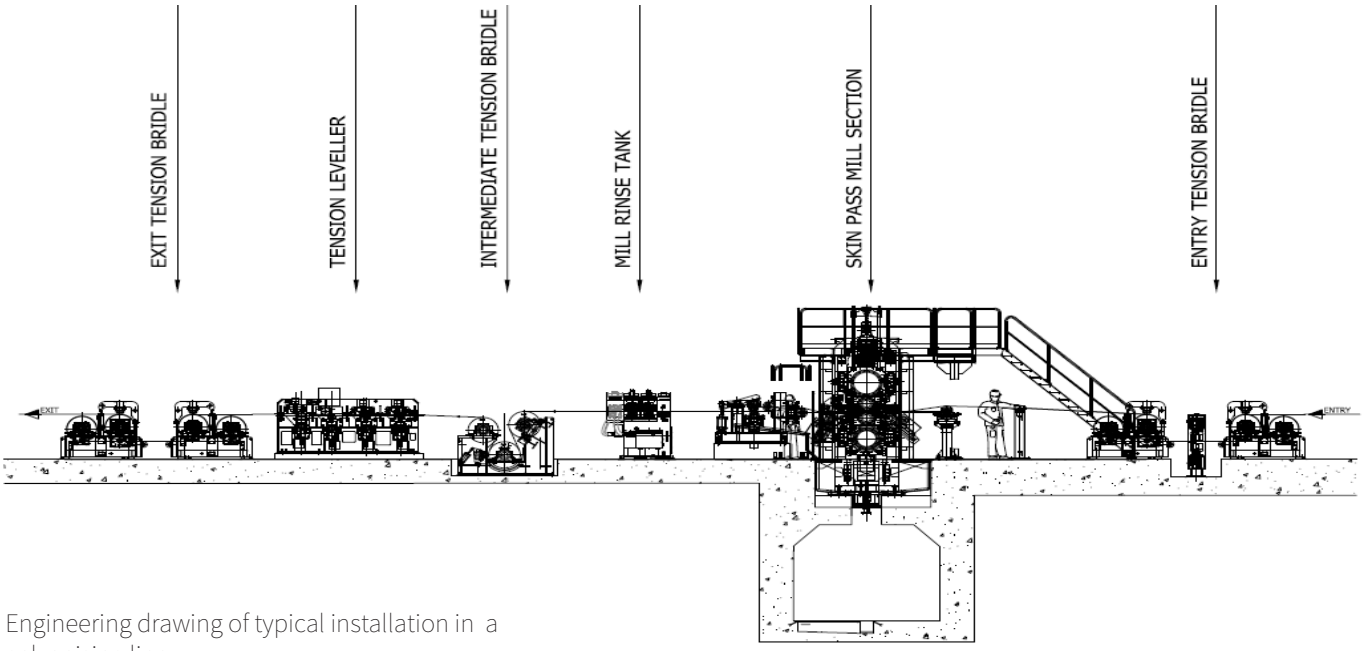
Quality Enhancement

There are many ways of introducing tension levelling as a quality enhancement process in the manufacturing of coil material in both the ferrous and non-ferrous industries.

A ‘simple’ stand alone line can be installed consisting of a motorised uncoiler followed by an entry bridle, levelling machine, exit bridle and recoiler.

The ‘simple’ line can be extended to include processes such as edge trimming, slitting, degreasing, oiling, embossing. A line can be easily designed to build up or reduce the size of coils or used as an inspection line to remove faulty sections of a coil allowing 100% prime coils to be delivered to a customer.

A tension level section is now commonly used in the process section of continuous galvanising lines. Working together with a skin pass mill, the material produced will be ideal for applying paint for the Construction, Whitegoods or Architectural industries.



Engineering drawing of typical installation in a galvanising line

Many new continuous paint lines include a Tension Leveller section. The leveller can be installed either before the cleaning and pre-treatment section or post painting section. It is also possible to retrofit a levelling process into an existing line with carefully considered design.

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