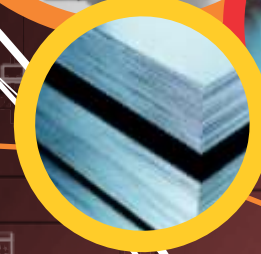
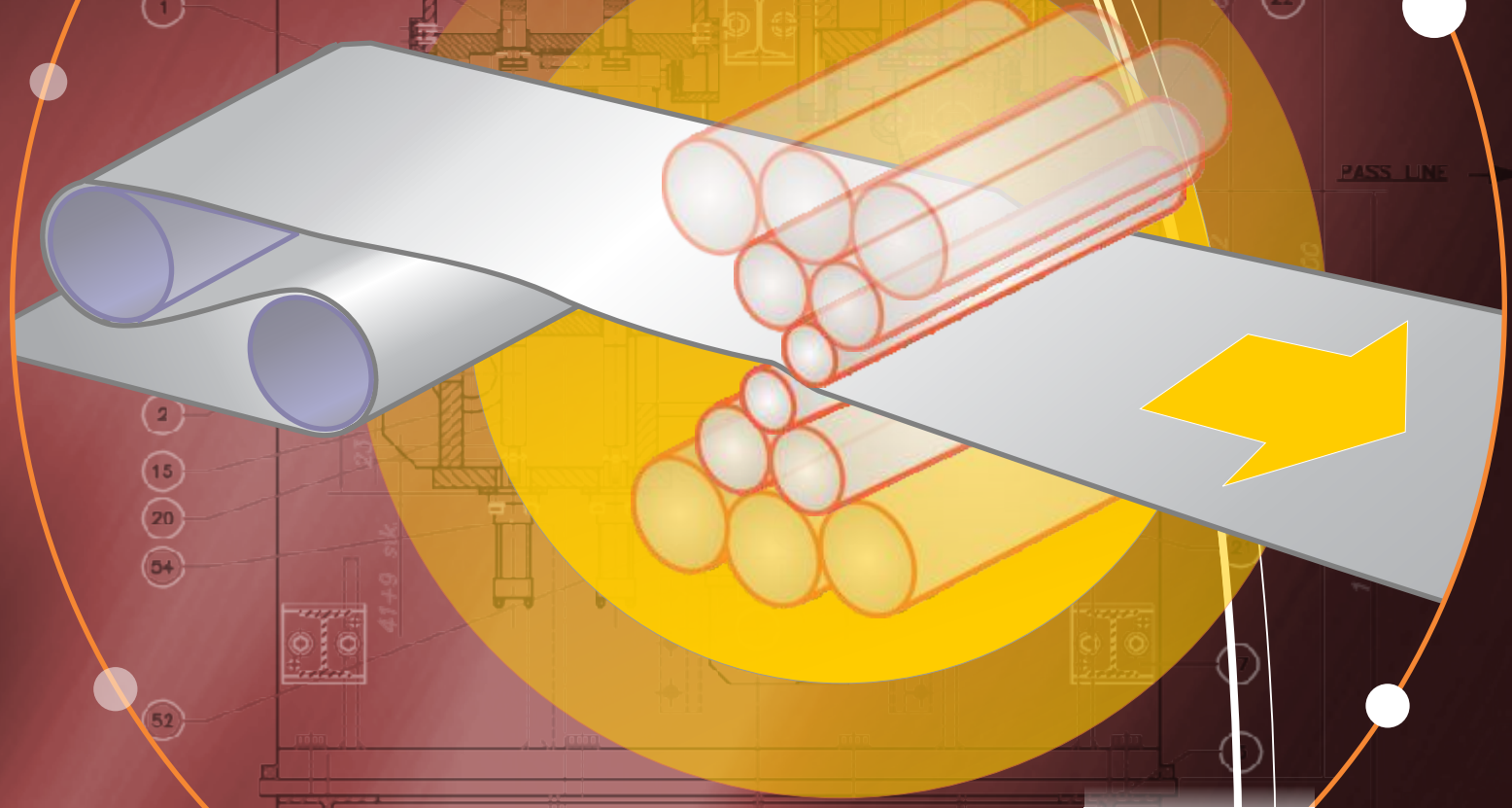


HYDRAULIC CYLINDER (DOUBLE ACTING)  
FRONT REEL F.W. MFG.  
BORE 400 x ROD 125

H.V.D. CYLINDER (DOUBLE ACTING)  
FRONT REEL F.W. MFG. (COMPACT SERIES)  
BORE 400 x ROD 125



### Tension Leveler



**MAGADH** MAGADH PRECISION EQUIPMENT LIMITED  
(A Government of India Recognized Star Export House)



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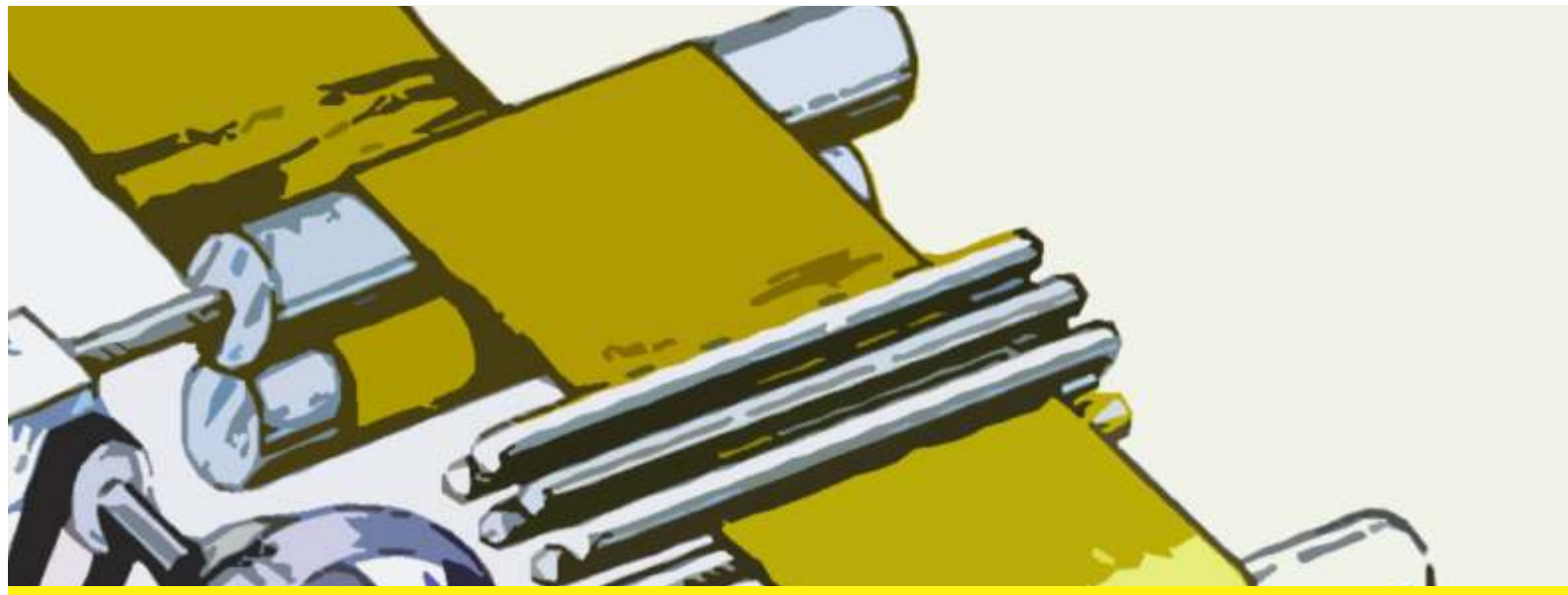
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Before



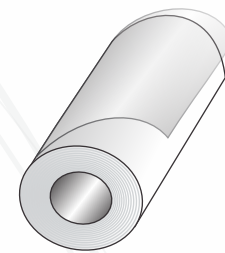
## Strip defects

The market demands better quality appliances, cars, homes, and improved quality products in general. There is increasing demand for better product quality. New and sophisticated forming equipment, including automated feeding systems, also requires flatter flat-rolled products to avoid jams and other kinds of problems. *Sheet - metal flatness* has become more important to the manufacturing process than ever.

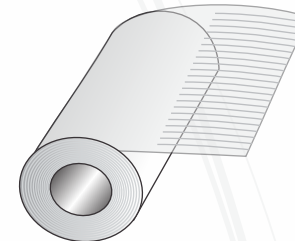
There are many *kinds of strip shape defects*, but they fall in to the following basic classes:

- A) Surface to surface length differential (coil set)
- B) Edge to edge length differential
- C) Edge to edge thickness differential
- D) Surface to surface length differential (crossbow)

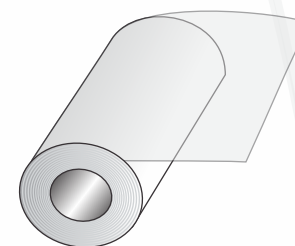
A) Surface to surface length differential (coil set)



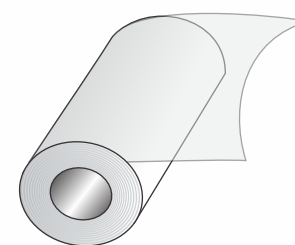
B) Edge to edge length differential



c) Edge to edge thickness differential



D) Surface to surface length differential (crossbow)



## Magadh can offer tension leveling system to remove various defects.

Tension leveling is the elongation of all portions of the strip so that all areas are stretched beyond the material's yield points thus achieving uniform strip fiber length. This is accomplished by passing the strip under tension through a series of up and down bends so that the shorter strip fiber attain the same length as the longer strip fibers. As the strip exists the leveler, the depth of the final bend is reduced, thereby eliminating the curvature caused by bending. When the lengths of all fibers are essentially the same, the strip is leveled.

Tension leveling produces a uniform plastic deformation across the entire width of the strip. This introduces a new, homogeneous stress pattern that avoids the problem of distortion due to aging. Other properties such as hardness and yield strength are not materially affected.

Tension Leveler



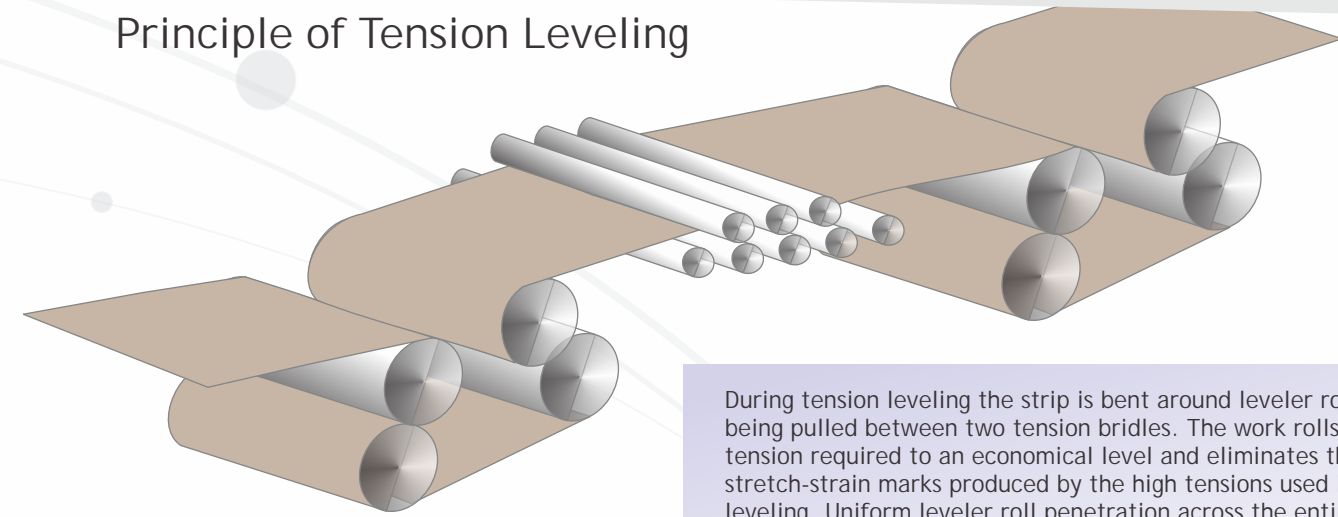
After

Tension Leveler



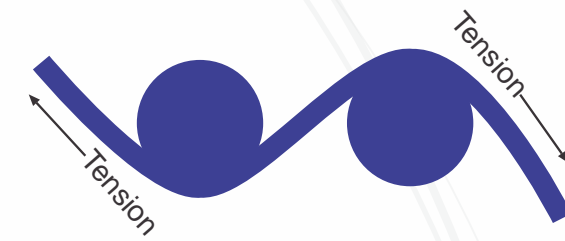
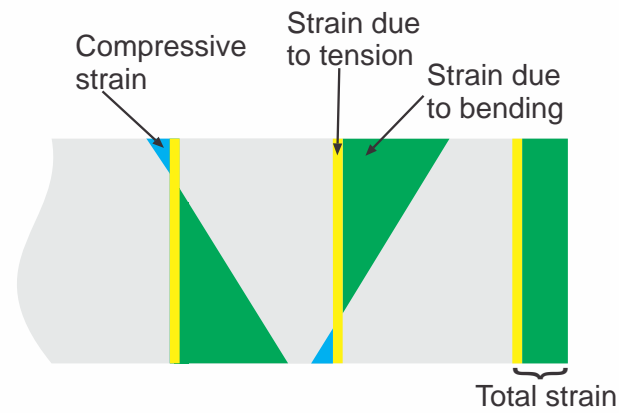
Tension Leveler

## Principle of Tension Leveling

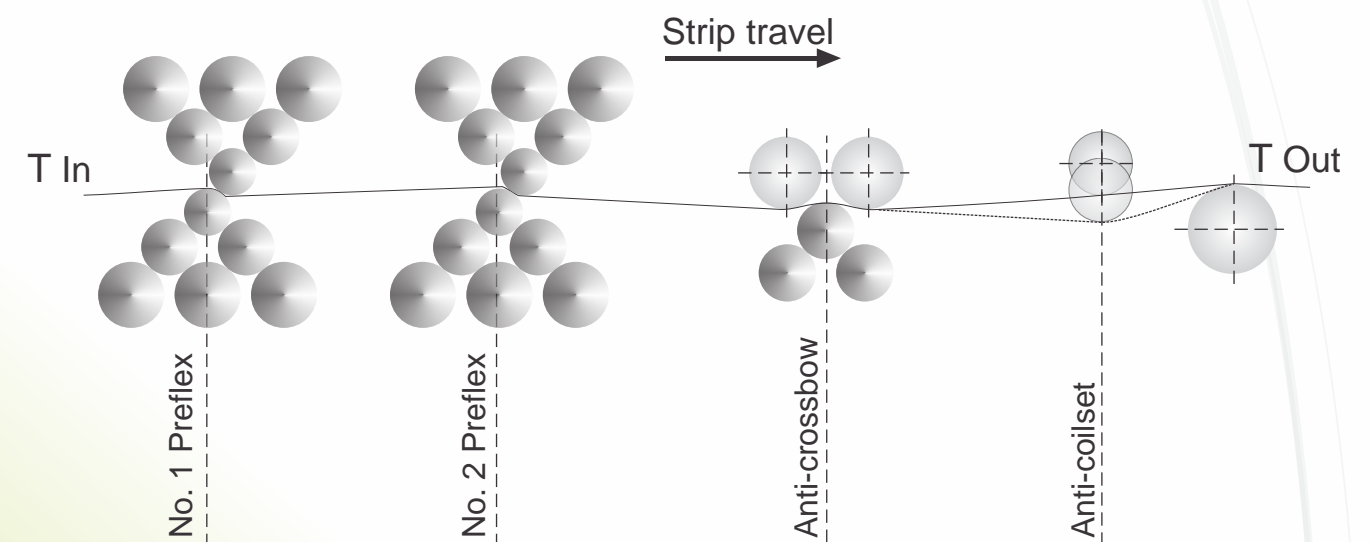


During tension leveling the strip is bent around leveler rolls while it is being pulled between two tension bridges. The work rolls reduce the tension required to an economical level and eliminates the problem of stretch-strain marks produced by the high tensions used in pure stretch leveling. Uniform leveler roll penetration across the entire width of the strip eliminates the complex problems caused by the variable meshing action of multi-roll levelers.

Tension leveling produces flat, straight coils without buckles, wavy edges, oil canning or camber. It provides permanent elongation of the metal, panel flatness and removes the stresses present in the strip for optimum foil quality. It produces the same high quality elongation coil regardless of incoming coil shape. This dramatic improvement in coil quality is required by subsequent processes and many end users.



As the radius of strip curvature decreases the neutral axis is shifted increasingly towards the center of the curvature. Displacement of the neutral axis permits strip elongation at strip tensions far below the yield strength of the metal.

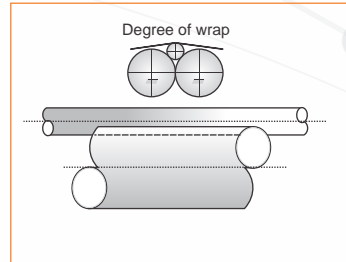


Roll assembly arrangement in tension leveler may consist of four or more work roll modules and a curvature correction (crossbow) roll module. The size and number of work rolls is a function of the material thickness range, yield strength, line speed, elongation, and tension constraints. The work roll diameter is determined by the highest yield strengths at the minimum thickness (maximum diameter) and the maximum thickness (minimum diameter) for a given type of material.

Tension Leveler

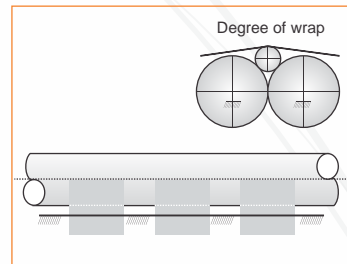
Since work roll diameters are small and their rigidity is imperative, support systems are required. For ease of maintenance, work roll and their support systems (back-ups) are configured into removable modules. The modules are designed to provide the work roll rigidity and the necessary angle of wrap. The most common module configurations are :

Work roll supported by two large diameter full faced back-up rolls



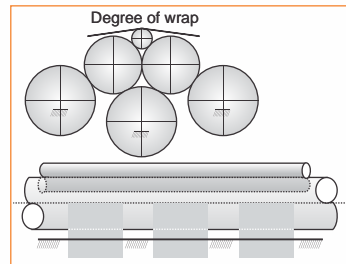
Work roll support : 4-high with full-faced backup rolls

Work roll supported by segmented back-up rolls



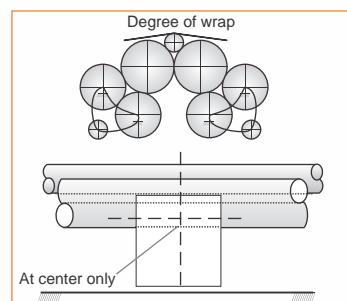
Work roll support : 4-high with segmented backup rolls

Work roll supported by two medium diameter full faced back-up roll supported by three rows of segmented back-up rolls



Work roll support : 6-high with segmented backup rolls

Work roll supported by two medium diameter full faced back-up rolls, each supported by two narrow faced rolls



Work roll support : modified 6-high, centre supported

To ensure that strip traction turns all the rolls, it is important to reduce the drag caused by bearing seals and lubricants. Modules employing segmented or narrow faced back-ups cannot use automatic lubrication systems for fear of contaminating the strip. These style modules require planned maintenance based on footage processed due to the limited amount of prelubrication.

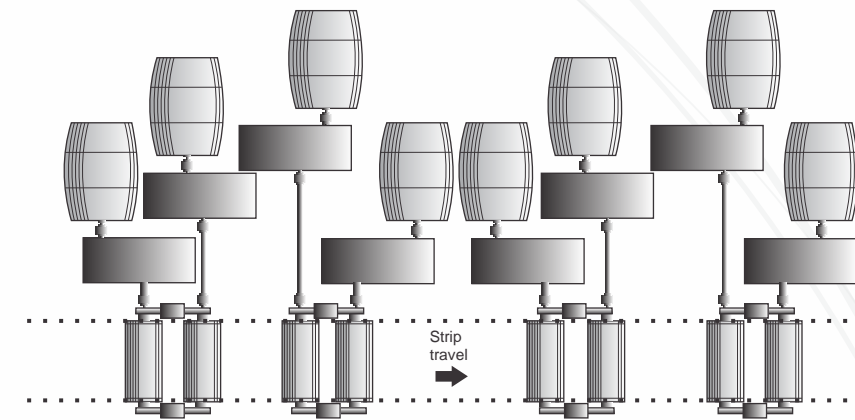
Magadh's tension levelers feature module removal systems to allow easy access to the module, for roll changing or cleaning. In addition, modules are made to be interchangeable and thus are required to be self-aligning. This is essential as the work rolls are required to be level and parallel to each other to tight tolerances (typically  $\pm 0.05$  mm.)

The versatility of the Magadh leveling system is illustrated by the choice of drives and available to meet customer's requirements in cost, power and precision of control.

## Electrical Drives

In the all electric drive system, the bridge rolls are driven by individual motors thru individual gear reducers. The system allows high speed operations without strip chatter at the stretch amplifier. It can have two, three, four, or more driven rolls in each bridge. The drive motor horsepower is arranged to proportionately share the load to be developed.

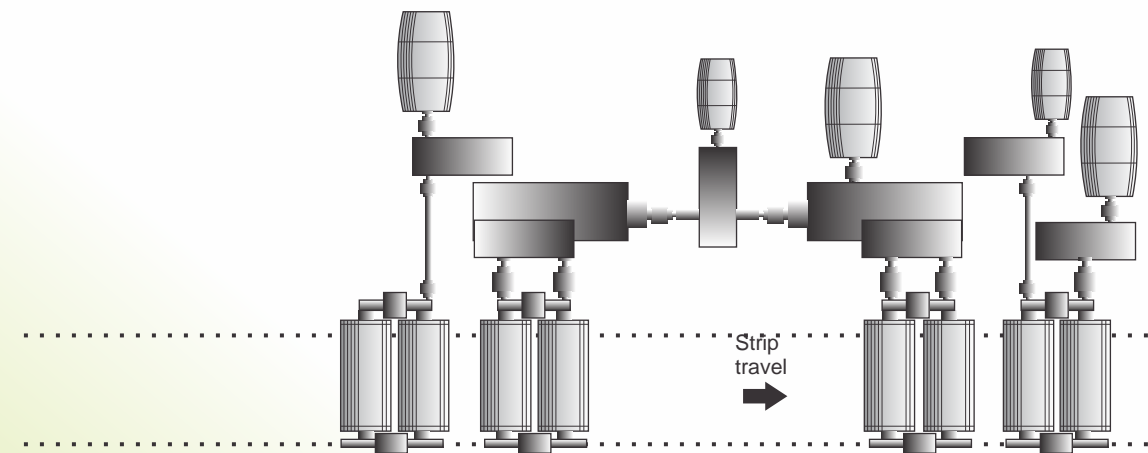
This system offers many advantages. It is easy to install, requires less maintenance, less operator training, and is economical. The bridge rolls need not be exactly the same size, so rolls can be ground individually rather than in sets. Controllability of the system is excellent because state-of-the-art components produce immediate response to correction and a higher level of automation in operation.



## Electro-Mechanical Drives

For applications requiring high stretching tensions, the electro-mechanical drive system may be more advantageous, in terms of cost, than an all electric system. The electro-mechanical system has one or two high tension rolls in each bridge mechanically connected through a differential gear box. The remaining rolls are individually driven.

Electro-mechanical systems require matched bridge roll diameters so individual roll maintenance is impossible. In addition, high line tensions requires more operator expertise and attention.



Magadh offers Automatic Elongation Control on all tension leveling lines.