ROLLFORMING – BASICS

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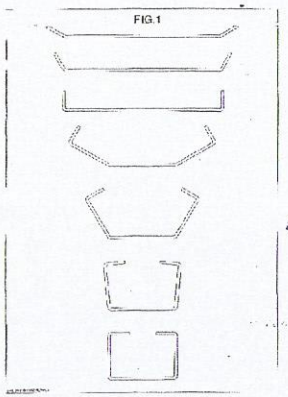
In this Thirtyfourth series of articles on Rollforming we will discuss about the rollforming basics.As compared to press-braking the stresses developed in rollforming is more complex. The design process of rollforming tooling is about 80% experience and 20% theory. Rollforming is a process which progressively forms sheet metal in coil form or sheet form into the final required shape using driven pairs of top and bottom rolls placed behind each other in series. Fig. 1 shows the flower diagram of a typical final shape of lipped C-Section that could be formed starting from plain sheet form.



In India in order to reduce the cost of tooling the tendency is to keep the number of forming stages as minimum as possible. In order to do that one requires to have the basic knowledge of rollforming theory. Not being an exact science, it requires experience, good judgement and a knowledge of the bending of metals.

There are some general rules:

- As far as possible the strip is formed upwards.
- Long vertical side walls are avoided wherever it is possible.
- Blind corners or radii are avoided. Forming accurate sectional dimensions is easier where the section can be controlled by the rollers.
- Regarding the bend radii- the customery practice is to make the inside radius equal to the thickness of the material being formed. The type of material being formed governs the possible inside bend radii. Ductile steels can be formed to zero inside radius, but those that have been roll hardened generally require greater radii to prevent cracking.
- The forming usually starts near the center and works forward the edges. This avoids tearing which might occur if the edges were formed and acted as a lock against material flow toward the center.
- In order to prevent buckling between passes, and to put the strip under tension during rolling each successive roll should be slightly larger than the one placed behind.

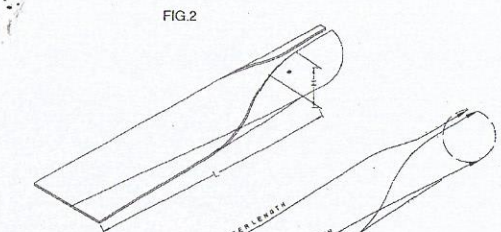
Spring Back:

Spring back is encountered to a varying degree depending upon the design of the section, the properties of the metal, and the method of forming. For most materials it may generally be eliminated by slightly overbending in the next-to-last pass. While the roll design for soft stainless steels does not materially differ from that for low carbon steels, the high spring-back of the harder tempers of stainless steel necessitates special measures.

Determining the number of passes:

In rollforming, deeper the section, the more number of forming stages would be required. Also the distance between the successive forming stands plays a great role.The reason for this is illustrated in Fig.2. The sketch shows the formation of a rollformed open-joint tube starting from plain sheet.The length of the bend line in the middle of the sheet till the finish of the formation is shown as L. Here the edge of the strip moves in a helical pattern for the same length as well as upward by an amount H which comes to slightly more than the distance L.Hence from pass to pass there is a stretching effect on the longitudinal edges of the strip.Now, so long as the uniform linear stretching of the edges remains within the elastic limit of the material to be formed or clearly below the yield stress there are usually no problems. But once it exceeds the elastic limit there would be a permanent stretching taking place causing edge waviness. This would also cause curvature of the section and spring-back at the ends of the section or the cutoff points.

It is not possible to reduce all the factors that influence roll forming to mathematical terms and thus obtain formulas by which rolls to form a specific section may be automatically selected. There are some rules of thumb and empirical formulas which , according to some roll form designers has been found to be a dependable guide for the determination of the number of roll passes required for simple shapes of



carbon steel . Using computer aided design the stresses can be calculated in the formed section to arrive at the number of passes required. Another method is to assume the number of passes first , prepare a flower diagram and then calculate the developed stresses. A few companies in the west have developed computer softwares which could assist in designing the rolls much faster than earlier.

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Even for using the softwares one requires a basic knowledge of rollforming and metalforming processes.

There are still some designers with special design a set of rolls to form a specific shap without consciously resorting to the use of arbitary forming angle. The experienced ro forming can use the so called 'flower" meth determing the amounts of progressive form that should be performed and then the num roll passes necessary. The method derives i name from the appearance of superimposed drawings of the shape as it passes each successive set of forming rolls. This is also called the progressive unfolding of the sect the flat strip.

Some people confuse cold roll forming to c rolling process. In cold rolling the thickness the material gets reduced and the rolling lo required is several times that is required fo rollforming. In cold roll forming process th thickness of the material to be formed does get reduced and the rolling load developed fraction of the cold rolling load. In cold rol forming the roll gap maintained should not less than the thickness of the material to be rolled. In order to reduce the cost of rollers many of the designers resort to open type c design. By adopting the gate type of roll de the tendency to cold roll the material instea rollforming could be avoided. Sedvik Indu Bangalore has been in the field of manufac of rollforming machines since 1986.

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