

ROLLFORMING - MANUFACTURE OF SECTIONS

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In this Fortieth series of articles on Rollforming we will discuss further about the manufacturing aspects of sections as such. Lubrication is one major area which requires to be touched upon. Also we will discuss about the achievable tolerances in rollforming.

Lubrication

A thin lubricating film on the strip material is necessary to increase the roll life and to reduce heat generation during rollforming. For rolling at higher speeds proper coolant lubrication is necessary. Deeper the Sections to be rollformed there is a rolling speed differential along the depth of the Section. This creates higher boundry friction, more heat and surface marks/damage.

The most common problem in rollforming is pick-up. During rollforming operation, small metallic particles known as fines adhere to forming rolls. The two uncoated materials that give most problems with pick-up are unpickled hot rolled strips and aluminium strips. The forming of SS, especially when a bright or highly polished stainless steel is being rollformed, can pose problems because it does not retain lubricants as readily as other metals. For this reason, solubles with super-wet characteristics have been formulated for rolling SS. Heavy duty evaporating compounds containing extreme pressure agents and good antiwipe properties are also being used for forming SS. For prepainted, coated and galvanized strips evaporative type of lubricants are generally used. For rollforming of aluminium sections evaporative type of compounds could also be used.

Tolerances in Roll Forming

Among the factors affecting the tolerances that can be achieved for Rollformed sections are the size of the sections, the material properties, the equipment, the type of product and the thickness and thickness tolerances of the strip material. Tolerances also vary due to material springback properties, variations in material width, tooling quality and wear, machine condition and setup as well as operator skill. Unecessary tight tolerances will result in increased cost and rejections, longer development time and the need for higher grade material. Normally for tighter product tolerances more number of forming stages would be required including repetition of final passes.

Usually the rollers are designed for the maximum thickness of the material to be rollformed. Once the rollers are made for the maximum thickness to be

rolled, trying to roll using the same toolings thicker material will cause breakage of rollers or might damage the rollshaft bearings or rollshafts. However, lesser thickness material could be rollformed on the same toolings. Best tolerances would be with the thickness material for which the rollers are designed. For lesser thickness material if there are no roll adjustment possibilities envisaged a slight bagginess of the sections will occur and the tolerances won't be that tight.

For best tolerances the strip material used should have very less camber. Camber is the deviation of the strip edge from a straight line in the horizontal plane. The inside concave edge of the strip is shorter than the outside convex edge. During the rollforming process the strip is straightened and as a result the shorter edge will be under tension and the larger edge will be compressed. Depending on the condition the compressed edge may become wavy. Ideally symmetrical sections will give the best tolerances. When a non-symmetrical section is rollformed the finished product will have a twist after leaving the last pass. By taking care in the roll design stage itself twist could be very much reduced.

When the section comes out there would be sometimes bow in the section. This is caused by the misalignment of rollers in the rollforming machine, coilset in the coiled material, thickness variation along the width of the strip or longitudinal thickness variations. Finally, all these bows and twists are corrected by using proper exit straighteners.

Following are the normal commercial practice tolerances. Tighter tolerances are achievable but they should be on mutually agreeable basis between the customer and the supplier. If there are several dimensions normally there are only a few critical dimensions which will have to be closely maintained. The

remaining dimensions could have open tolerances which can vary usually from + 0.5 mm + 0.8 mm

Cross-sectional: + 0.3 mm

Angular Dimensions: + 1 degree Straightness (bow or camber) 1 mm per 600 mm length

Twist: 1.6 degree per meter length Length

Tolerances: can vary from a minimum of + 0.5mm to + 6mm depending on lengths.

Figure A to Figure N are some of the typical sections that could be produced using the rollforming method. The future trend in rollforming is going to be in the direction of closed sections which have high strength to weight ratios. Sedvik Industries, Bangalore has been in the field of manufacture of rollforming machines since 1986.

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