



# End forming of rectangular and square tube

## OPPORTUNITIES ABOUND FOR REDUCING DIES

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**E**nd formed tubes are used increasingly in industries as diverse as automotive, furniture, appliance, sporting goods, construction equipment, and temporary buildings. With recent developments in new forming techniques to produce accurate, finished parts at high volumes without scrap, end formed parts are replacing some conventionally machined components.

End forming applications practically are limitless. Ranging from the simple to the complex, they include reduction of the outside diameter, expansion of inside diameter, flaring, beading, and completely altering the original shape.

Square and rectangular tubing present unique challenges for end forming. Inline forming is a traditional forming method for square and rectangular shapes; however, segmented tooling has been growing in acceptance for forming these shapes.

### A Conventional Approach

Inline forming is a process in which a workpiece is held in a clamping device and a tool is pushed over the workpiece to generate the desired profile. While suitable for many applications, this method has several drawbacks.

The tooling cannot be adjusted for various sizes of tubing—it is dedicated to one size only.

The length of the end form is determined by the travel of the tool and length of the tube that is not clamped by the clamping dies. This distance can cause the end form to be off-center from the original part. Off-center end forms can render the finished product unusable—for instance, a garage door track assembled from track sections with off-center ends has transitions between each section. If the transitions, or steps, between each section are too extreme, the garage door mechanism cannot travel the length of the track.

Also, tool life is a concern because of the friction forces involved and

possible presence of dirt particles or metal burrs.

### Segmented Tooling

Another approach for forming square or rectangular tube is to use segmented tooling. The most common application is a slip fit in which the end of one tube slips into the end of another tube.

Segmented tooling is based on four dies closing simultaneously. This action applies the work force all at once. In addition to completely altering the original shape, segmented tooling can offer a better-defined transition area with increased strength. An expanding mandrel can be used for applications with complex profiles; a simpler fixed mandrel can help direct the material flow in the desired areas.

The internal dies, which are informally called expanding fingers, can be moved into positions that define the exact internal profile of the tube. After forming they can collapse a small amount, reducing the amount of force required to