Introducing: Metal folding

In the last several years, interest in automated metal folding technology has grown in the metal fabricating industry all over the world. Fabricators have become interested in folding because it is less tool- and labor-intensive than traditional press brake technology, it is therefore the ideal bending method for small and medium batch sizes and improves parts quality dramatically.

Depending on the application folding machines can co-exist with press brakes, or can even replace them. They are ideal for short-run, Just-In-Time (JIT), or cellular-type bending applications.

The folding technology has reached totally new levels of flexibility and sophistication. While machines may differ in speeds, capacity, and accuracy, they all bend in the same manner:

The metal is laid upon an integrated sheet support and parts backgauging system.

The metal is clamped between the upper and lower clamping beam.

The folding beam sweeps upward to form the desired angle of the bend.

During the entire folding sequence the materials stays on the sheet support and backgauging system. Therefore the parts quality is independent from the operator. With press brakes the operators support the part and their skill is responsible for the quality of the part.

When creating a hem the folding system uses its standard upper tool geometry while a special tool on a press brake is needed. Again the operator must hold the part outside the machine. When parts are large, handling time can be quite substantial and at least 2 operators are required.

Advantages of the folding technology include:

Material handling is quick and easy because the material is supported by the machine instead of the operator. Multiple operators are
usually not needed. This reduces the labor costs dramatically. Simplified material handling improves the cycle time, especially when parts are large.

The folding beam changes planes instead of the operator and the material changing planes. Therefore even semi-skilled operators are able to create perfect parts after only a few hours of training.

Large panels can be run from the rear, small parts from the front side of the machine. The additional flexibility offers a perfect material flow without any additional investment.

Slippage of the material is eliminated during the bending process. This allows even bending of perforated materials with perfect and repeatable flange dimensions.

Tolerances in material thickness do not influence the folding result, because the folding beam always references the outside of the material. The folding technology therefore creates perfect bend angles even without an additional angle measuring system.

Folding is suitable for sensitive material surfaces such as stainless steel, pre-painted or coated material. As the relative movement between the tools and the material surface is almost eliminated, the folding technology does not create scratches on the material surface.

As the folding system gauges the part instead of the part’s flanges, any intolerance in the sheet size will be folded into the first bend of each direction. All the other flanges and especially the length and width of the part will always show the correct dimensions. This is critical when parts need to be fitted together.

Hems can be produced much easier with folding. No special tools are required. After the part is pre-bend by a swing of the folding beam, the upper beam presses the hem either completely flat, as a tear drop, or as an open hem with a required open dimension – depending on the material thickness and the application.
Less tool changing and much less setup time is required making the folding system ideal for short-run applications. Most often a folding machine uses only a single, universal set of tools to bend the complete range of desired applications regardless of the angle, flange dimensions, metal thickness, or metal type.

This tool flexibility reduces the investment in many different tools and storage cabinets, lowers the maintenance costs and because of the reduced setup and changeover costs the folding system starts paying for itself from the first day.

Operator health and safety hazards are reduced. Operators are not required to support the weight of the sheet metal, nor are they in contact with the part during clamping and bending cycles. As there is no "whip-up" of the part during bending the folding system is a much safer technology and does not require light curtains.

Objectives with a folding investment
The investment in a folding machine improves parts quality simplifies handling increases productivity by reducing handling and set-up-times increases flexibility lowers production costs (and after-treatment costs)

Handling and positioning of panels can be difficult, especially when they are large. However it is not only the question if the folded part is large. The more critical question: Is the punched or laser-cut blank large and complicated to handle? The integrated sheet support and backgauging system holds the weight of the part. Therefore that a single operator is able to create finished workpieces with the same quality from early in the morning up until late in the afternoon even on a hot summer day.

Folding treats the material surface much more careful than press brake bending and provides minimal material surface damage. This is especially useful when sensitive surface material is used, such as stainless steel and pre-painted or coated metals. Using a press brake there is relative movement between the workpiece and the tool when the upper tooling presses the material into the lower V-tooling. The sheet metal is first bent in a free bending process, then is pressed into the lower tooling by the upper tooling. The sheet metal scrapes along the shoulder of the tool. Consequently, the sheet metal surface is subject to scratching.

In a folding system the folding beam rotates upward around its pivot point and rolls away with the material. It is like folding a paper airplane: first you clamp the large flange and then you roll the short flange up with your thumb. So folding is the natural and smooth way of bending sheet metal. Except for extremely sensitive materials, it is possible to bend parts with virtually no scratches on the surface. Even lacquered and coated sheet metals can be run without using a protective film.

For panel production a folding machine is a must. While a press brake positions the flanges all cutting-tolerances are kept in the middle section of the finished part. This is most often the most critical flange of the finished component, when parts must fit together and causes problems in later on assembly or welding operations. With folding systems the integrated sheet support and backgauging system positions the part instead of the flange. All cut-
ting tolerances disappear while bending the first flange where often a hem provides additional stiffness and is used as safety edge.

As the folding beam on precision folding systems swings up with 0.1-degree accuracy, precise and repeatable parts are guaranteed. In addition the folding beam references always the outside of the material and therefore material thickness tolerances do not influence the angles.

When using a full rail folding beam tool only, there is no need for a crowning system to compensate the deflection created by the bending forces. The folding beam is designed as a deep, stiff and torsion-free machine component, that can resist the bending forces, and in addition the folding beam tool is a little higher in the center than at the outside. However, if the folding beam is equipped with segmented tools for internal bends and other applications, some folding systems offer an integrated and adjustable crowning system, so that extremely straight bends can be achieved for any material thickness.

Flexible production of small batch sizes or single parts production requires a low set-up time. With folding machines there is typically no need for different upper tools when: the material thickness changes - material quality changes - the bend angle changes.

This does not affect only the investment but more important the daily changeover costs. Tooling can be segmented for all of the beams. For example, to bend four-sided boxes, segmented upper beam tooling is available. This tooling is called goat’s feet because of their unusual shape.

Important considerations for tool choice include: Geometry: heights, front clearance, rear clearance, and toe angle. Strength: ability to resist deflection. Hardness: for stainless steel applications, tools must be heat-treated.

True Just-in-Time, short-run metal forming goals can be achieved with automated or quick-action tool clamping which allows part size repositioning within seconds done by the human hand. No additional tool fixing is required on systems that automatically lock the upper and folding beam tools in position as soon as the operator is ready to work.

In addition the CNC screen provides the graphical setup information, stored together with the program. The operator just takes the tool segments shown on the screen from the tool carriage, places them along the working length of the beam and is ready to run the next part. Changeover to another part takes usually less than 2 to 5 minutes and therefore leaves much more valuable production time compared to traditional press brakes, where tool change often takes 20 minutes or more.

With press brakes the part often cannot be finished in one set-up, but requires multiple han-
Folding systems allow a multiple station set-up along the working width of the machine. Parts with 30 bends and more and also different bend angles, open or closed hems and bends inside of the part can be finished with one set-up. As the part stays at the sheet support and is positioned by the back-gauging system, there is no need for the operator to lift the part. Therefore even large parts can be run by a single operator.

The fascinating Touch&More CNC is the most easy to use CNC control in the folding machine market today. The operator just draws the part with his finger and the Touch&More CNC instantly creates the program.

Step by step the 15” screen shows how the part is going to be created including the real tool and machine geometry. If this component comes as a parametric part, the operator just calls for this program, enters the variable dimensions and is ready to run the next part. The operator just presses the start button and creates perfect parts.

Specific applications for which metal folding could be considered, if appropriate for each fabricator’s individual operation, include:

- Metal doors/furniture/shelving.
- Transportation equipment.
- Control boxes.
- Electrical enclosures/equipment.
- Cooling or heating equipment/ovens.
- Machinery/machine tools.
- Building/construction/architectural.
- Lighting equipment.
- Restaurant equipment.
- Medical equipment.
- Elevators/conveyors.

In general, metal folding can be helpful to users who make complex or large sheet metal parts in short-run operations and, in particular, for panel bending. Fabricators should examine their specific operation to determine the best options for quality and cost-effectiveness.