

### About BLM GROUP





#### BLM GROUP Product Lines

LASERTUBE | BENDING & END-FORMING | SAWING & END-MACHINING | SHEET LASER CUTTING



HIGHER PRODUCTIVITY AND REDUCED COST PER PIECE THROUGH PROCESS INTEGRATION



# BLM GROUP

#### LASERTUBE







SEAMLESS INTEGRATION OF THESE TWO PROCESSES TO SIMPLIFY MANUFACTURING AND REDUCE COSTS



### Our Part



This part has 4 passing holes on the central straight part on each limb of the part

The requirement is that the two holes on one side are perfectly aligned with the two holes on the other side.

A stainless steel rod need to pass thru' these holes.



SEAMLESS INTEGRATION OF LASER TUBE CUTTING AND TUBE BENDING

# **Conventional Process Steps**





#### SEAMLESS INTEGRATION OF LASER TUBE CUTTING AND TUBE BENDING

## BLM Group's "All In One" Processes

- Laser Cutting of straight tube including holes or other features
- Bending – On ALL-ELECTRIC bending machine.



The only limitation of this process is that the holes or features that are in the bend area or close to the bends can't be cut before bending.

BLM Group has another manufacturing solution for such parts called LT FREE.



SEAMLESS INTEGRATION OF LASER TUBE CUTTING AND BENDING

### In Straightened Form

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#### SEAMLESS INTEGRATION OF LASER TUBE CUTTING AND TUBE BENDING

### In Straightened Form With Corrected Length





#### SEAMLESS INTEGRATION OF LASER TUBE CUTTING AND TUBE BENDING

## Part Without Corrections





WITHOUT CORRECTIONS THE HOLES ARE NOT OPPOSITE TO EACH OTHER AS DESIRED

# Part With Corrections





#### WITH CORRECTIONS THE HOLES ARE OPPOSITE TO EACH OTHER AS DESIRED

### ALL-IN-ONE – BUILDING BLOCKS

The ALL-IN-ONE Technology can work only if each step guarantees the repeatability of the process.

Weld seam position plays an important role on the repeatability of the bending process.

Weld seam is detected and positioned to the desired position on laser tube cutting machine as well as tube bending machine.

The off-line programming software VGP can automatically position the weld seam at the most suitable location in the bending cycle. It tries to position it on the neutral axis for as many bends as possible. It also takes into consideration the degree of difficulty related to each of the bends.

ALL-ELECTRIC technology removes the errors related to the machine set-up and hence guarantees good repeatability.

The importance of good quality material is paramount and no technology can deliver results if the raw material is not consistent within a given batch.



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Note the black line indicating the weld seam. Position of the weld seam on a bent component is important for two reasons: tube integrity and aesthetics.

It is automatically positioned considering the plane of bend and the angle of bend. The software tries to keep it on the neutral axis or on inside as far as possible.

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The seam detection is done using an optical sensor that senses the color difference.

If you can see the seam the the sensor can see it. There are different parameters to set the sensitivity of the sensor.

The rolling marks on the tube are sometimes very similar to a weld seam and that poses a challenge.

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On some machines the sensor checks the outer and inner surface of the tube and this increases the reliability of detection.

For polished stainless steel tubes an inductive sensor is used to detect the seam. This system is bulky and hence its integration on the machine is not common. It is normally integrated on the loader.



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Weld seam detection is done on laser cutting machine too because one doesn't want to cut holes or features on the seam. So the weld seam is detected and oriented to desired position before cutting. On bending machine the weld seam / holes are detected before bending. The detection accuracy is better for holes than that for weld seam.

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One more challange in weld seam detection is that on some tubes, especially round tubes, the weld seam does not form a straight line along the length of the tube. This fact poses some problems because then on the finished component the weld seam (and related cut features) do not appear at desired position.



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### Automatic Weld Seam Positioning During Processing

VIDEO SHOWING THE SEAM DETECTION TO BE INCORPORATED.



## Processing Of Copper & Aluminum Tubes



This system integrates various operations:

- Decoiling
- Straightening
- End-forming
- Bending
- Cutting



## Tight Bends In Aluminum & Steel Tubes

Designers are forced to reduce weight and child parts to save on costs.

This results in increasing demand for low wall thickness tubes with sharp bends.

Sharp bends eliminate the elbow fittings and related processes but creates challanges As far as the bending process is considered.

These requirements are fulfilled by properly designing the bending tools and complete control of the bending process made possible by ALL ELECTRIC tube bending machines.

We have achieved tight bends with CLR less than 1D in mild steel as well as aluminum.



# Tight Bends In Steel Tubes





Steel - OD 25 mm, Wall thickness 2 mm, Mean Bending Radius 18.5 mm – MBR/Tube Dia ratio 0.74D

# Tight Bends In Steel Tubes

VIDEO TO BE INCORPORATED.



Steel - OD 25 mm, Wall thickness 2 mm, Mean Bending Radius 18.5 mm – MBR/Tube Dia ratio 0.74D

# Tight Bends In Aluminium Tubes





Steel - OD 18 mm, Wall thickness 1 mm, Mean Bending Radius 11 mm – MBR/Tube Dia ratio 0.61D

### Bending of Non Symmetric Profiles

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### Bending of Precious Metal Tubes With Scrap Reduction



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### Bending of Precious Metal Tubes With Scrap Reduction



## Industry 4.0 - Digitization

- Bending process has been digitized due to ALL ELECTRIC Technology
- All the parameters of bending process (forces, positions, speeds of various movements etc) are part of the CNC program and are saved with the program. This practically eliminates the set-up process saving time and material.
- What remains to be done is to load the right program on the machine and install correct tooling.
- To help an operator to correctly identify the tooling TOOLROOM application has been developed.



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- TOOLROOM manages the tool stock a Customer has.
- It is extremely useful to keep the track of tools that are present, those that are being used the ones that are available and their compatibility for the forthcoming production batch.
- It also keep track of the usage in terms of number of bends so the Customer can decide a timely replacement.
- The tools are marked with bar codes or QR codes for identification and tracking.

