We feel everyone agrees that today’s business challenge does not involve “being able to produce”; instead, it involves “being able to compete”. Offering high-quality products capable of standing the test of time is not enough; you must offer solutions that make a difference.

In a world where supply is growing faster in quantity and quality, customers should be able to understand the differences and also identity the advantages resulting from a given choice. This is no easy task because there is no single ‘right’ choice; it all depends on the goal you want to achieve.

BLM GROUP offers suitable solutions for any variety of specific needs, by providing a wide range of products and helping the end user to understand their respective differences.

Let us consider, for example, the Lasertube product family. So many opportunities of laser tube cutting:

- What is the difference between cutting with a fiber laser source and a CO2 laser?
- What is the difference among the various 2D, 3D or 5D laser cutting technologies?
- What is the difference between handling a complex frame as if the latter were one single element, and handling the individual various elements that make up the same?
- What is the difference between being able to manage the machine program modifications and being unable to do it?
- What is the difference between using sophisticated tube position detecting systems vs. relying only on the mere mechanical accuracy both of the systems and the tubes?
- What is the difference between laser-cutting a tube and leaving the tube inside clean from debris vs. having to clean the i.d. at a later time?
- What is the difference between being able to integrate different processing technologies into one single process and having to consider one technology at a time?

Tell the difference and make your own choice!
Steel has always played a major role in the construction industry, owing to its excellent mechanical properties and its versatile use: these features are essential to build imposing structures that are often characterized by complex shapes. The tubular structures featuring round-section (CHS) elements, which have been manufactured during the past few years by combining stunning appearance with structural efficiency, provide a clear example of this. The difficult execution of the joints between CHS elements, mainly due to the 3D cutting of the element ends, has been one of the main reasons that have, in the past years, caused such elements to be used only for special applications, e.g. the off-shore structures, where the advantages given by the elements would compensate for the difficult execution of the same. Such difficulty can now be overcome by means of the 3D laser cutting technology, which allows you to quickly make items featuring complex shapes while ensuring very high quality and accuracy of the cut edge, which is an essential requirement for the attractive glass and metal structure covering the Mart square in Rovereto, TN, Italy.

Moreover, a change in the regulatory requirements for structural metal fabrication, through the implementation of two technical standards (firstly, the NTC2008 regulations, then the EN 1090 Standard), which have changed the ways and methods of designing and manufacturing the steel structures. The main innovations implemented by the EN 1090 Standard, which was implemented in July 2014, include the introduction of a concept relative to the steel structure manufacture class and the basic requirements applicable to the machined structural components by using the ordinary processing methods: all of the above aims at obtaining the EC mark for the structural elements, in accordance with the NTC 2008 regulations.

The optimum quality of the cutting surface that can be obtained by means of the laser cutting technology makes it possible to meet the requirements applicable to the strictest manufacture class (i.e. EXC4), garantendo quindi in automatica la rispondenza a tutti i requisiti di thus guaranteeing laser cutting’s compliance with all of the tolerance requirements established for every single type of structure. The EN 1090 Standard suggests, in regards only the structures exposed to fatigue loads and subjected to a high number of cycles (especially bridges), a direct connection between the local hardness (HV10) of the cut surface that does not have to be reworked (e.g.
holes, slotted holes or sections not to be welded) and the fatigue response. The aforesaid connection is, however, not matched by the experimental evidence of the studies and surveys made, over the past few years, as a result of the collaboration between the Department of Civil, Environment and Mechanical Engineering (DICAM) of the University of Trento (Italy) and ADIGE-SYS company, such a collaboration aiming at examining the effects of the laser cutting technology and the use of the same with structural steel elements machined in accordance with the EN 1090 Standard. The results of the research made on construction steel by the work team led by Professors O.S. Bursi and P. Scardi have pointed out the following, as regards the materials machined by means of laser cutting systems:

- the slight effects on the material’s mechanical properties (the heat affected zone features a very small thickness, i.e. approximately 0.15 mm)
- the material’s provide very good fatigue response, with values nearly the same as the ones for the identical material when machined by mechanical means (milling machine), despite hardness values (HV10) nearing the limit or higher than the ones suggested by the EN 1090 Standard.

This study, the first one of its kind, carries great significance for laser applications and, in particular, for structural use. Experimental evidence has for the first time been given – and a scientific analysis of these facts is being made – that no direct connection exists between the surface hardness and the fatigue response (brittleness). The laser cutting specimens feature a greater fatigue strength than the ones cut by making use of a mechanical tool (milling machine). Therefore, new opportunities arise for applying the laser cutting, holes, slotted holes and sections to a number of materials (even the special ones), contrary to the prescriptions in force until today.

Those who are not familiar enough with the terms used and the standards and regulations in force may find it useful to refer to the summarizing explanatory steps below:

The EN 1090-1 and 2 Standards (UNI-harmonized) have been in force since July 2014 and essentially establish that each piece of work shall be provided with an EC certificate. Therefore, new opportunities arise for applying the laser cutting, holes, slotted holes and sections to a number of materials (even the special ones), contrary to the prescriptions in force until today.

The conclusions that can be reached are described above, i.e. no connection exists, as far as laser cutting is concerned, between the hardness and the fatigue strength; despite higher values than the established ones have been found in some cases, the specimens are able to withstand the test better than the specimens cut by using a milling machine.

Based on these significant results, which have already been presented at industry meetings and workshops, first in 2014 and then in 2015, also thanks to the support by the Foundation for Steel Promotion (represented by its technical manager, Dr. Monica Antinori, a member of the National and European Standard review committees), we managed to have Table 10 removed from the next revision of the standard, which should be implemented this year.
EXPERIENCE

Complete metal structures, daring roofing, fire escape ladders and gates, intelligent supporting structures for special civil engineering projects: special complex constructions are the specialty of VILLING Technologie GmbH. These are the products that the innovative, a thirty man, metal working company based in Friesenheim in Baden, Germany, supplies to customers operating in various industries across Europe. The people at VILLING Technologie particularly enjoy being called for projects that stretch beyond the limits of conventional metal fabrication methods.
It is amazing to discover a metal fabricator that combines creativity, decades of know-how and next-generation production technology, like at VILLING Technologie. “I like to take visitors to see our production floor right away. Here, I can show them the huge variety of things that we can accurately make with a Lasertube LT20”, declared Konstantin Villing in the summer of 2015 during our visit to the plant housing the impressive 3D laser tube and structural steel cutting system. What the managing partner really meant was clear a few instants later.

“It is in joints that we have achieved unprecedented flexibility and accuracy. This means that we can implement a new approach to metal constructions”.

With Villing we reached the safety fencing guarding the loading station of the machine. True to the notion that ‘a picture is worth a thousand words’, the skilled mechanic and metal fabrication expert made the fencing himself to showcase what the system can do at a glance.

SPECIAL CASE SERVICE SUPPLIER

THE FREEDOM OF ANGLES, SHAPES AND SIZES

The entire structure consists of 150 mm diameter round tubes – that work as uprights of the structure – and square section tubes with an outer width of 60 mm. “For fitting we laser-cut the holes and cut both the circular and the square section tubes”, explained Villing pointing to the relevant areas. “Some of the joints are also welded to show how discreet and clean weld seams can be today”. The structure has a screwed couplings. In all cases, the accuracy of laser cuts and of the couplings is unquestionable.

The pinnacle of the creation was the use of circular section tubes that Villing made to project a good half a meter over the frame. This was achieved by making two-dimensional and three-dimensional laser holes and cuts at all possible angles in which the various circular and square section profiles and the tubes made of steels of different qualities are inserted. “When it comes to material, we are very flexible with the LT20: for instance, we can process S235 and S355 steel, stainless steel and fine grain construction steel”, said the businessman.

With regards to materials: “This fitted structure is also very stable without welding”, Villing took us to see a material store they made themselves in which IPE 400 sections of various lengths and truly impressive weights are stored along with other material. The frame is made of circular, square and rectangular section tubes simply fitting into each other: all cuts were made with a LT20.
Production time has been cut by at least 30 percent since the LT20 was commissioned in the autumn of 2015. This result is complemented by a drastic reduction of assembly time at the construction site because each part are guaranteed to match perfectly. All in all, the company is at least 40 percent faster than traditional production processes. The value is even higher in case of repeat orders.

From Villing’s point of view, the new harmonized European standard EN 1090 which governs the use of structural steel and aluminum elements for construction forces everyone – manufacturers and distributors alike – to change their approach. “Without certification of compliance to the standard there may be even legal consequences in case of damage”. Anyone who cannot document to have worked in compliance with harmonized standard EN 1090 should even expect customers to refuse to pay. There is no alternative to the new working method.

In VILLING Technologie, the LT20 is perfectly integrated with the computerized job preparation and organization. After the customer’s approval, the 3D CAD data of the steel structures designed at the company seamlessly flow to the Artube programming and simulation system of the system for CNC 3D section and tube laser cutting. Artube automatically creates the single optimized machine program and perfectly simulates the production process on the screen showing how it will be run on the tube and section laser cutting system.

This is the computer-to-laser cutting concept. The fully integrated, high-performance process offers unprecedented flexibility and accuracy to steel fabrications maintaining productivity and high economic efficiency at the same time. It also virtually eliminates all the common causes for error of conventional fabrications.

“We can only earn by offering tangible added value to our customers because only in this way can we overcome the discussions on prices that traditional fabrications suffer from. So we must look forward and invest in future perspective. In this way, we can calculate our prices and ensure they are convenient from the commercial point of view”, said Villing illustrating the reason why they had chosen to invest in next-generation 3D CAD technology back in 2006 and decided to buy an innovative BLM GROUP section and tube laser cutting system a year ago.

AN 18-METRE DISTINCTIVE FEATURE

Villing wittingly decided to install a variant of the Lasertube for processing materials up to 18 meters long with diameters of up to 508 mm and bar weights of up to 200 kg/m, because he wants to make that length a distinctive feature in the market. Some competitors can cut tubes and sections of up to 12 and even 14 meters long. For longer lengths there are fewer suppliers on the market. This is why these additional meters make a big difference, according to the businessman. The length offers the possibility of improving cutting results even further. On the other hand, they also process materials ‘just’ 6 meters long to exploit the entire range of the machine.

In addition to structures developed for customers, Villing wants to saturate most of the huge potential of LT20 for subcontracted jobs in the short term. Already now the jobs made for companies in the sector contribute to a basic work load. His intention is to start making and marketing his own products. It is obvious that there will not be 8-15 products and that the products will be made with this system. In one way or the other, the production flow can react to all market trends proactively and soundly.

“These proposals are of great value for our customers”, summarized Villing. “I understand this simply because in a normal situation no-one calls me back to discuss prices.”
Laser cutting of small diameter (<6”) and medium size tubes (<12”) is now a universally accepted industrial process; but is laser tube cutting and specifically the use of a fiber laser, useful when it comes to large diameter tubes? To find out the answer to this question, let us go to the Venetian hills in Italy, in the Prosecco wine region, to a company called Tubilaser S.r.l. For more than 15 years, Tubilaser has been a supplier of structural steel tubing and laser cut tubular components.

Tubilaser serves a wide variety of industries; construction (bridges and stadiums), agricultural machinery manufacturers, ski-lift structures for ski resorts, interior design and architectural elements, general fabrication, etc. In short, their customers can be anyone that uses laser cut tubular components. Tubilaser initially purchased BLM GROUP’s laser tube cutting technology as a way to differentiate themselves from other fabricators. According to Guido Bonaldo, owner of Tubilaser, “it was a way for us to be able to offer our customers better quality components at a lower cost”.

Tubilasers’ first venture into laser tube cutting was with a small diameter machine, a BLM GROUP model LT652, capable of cutting tubes up to 4.75” diameter and 20’ long using a 2kW CO2 resonator. Their second machine, a 5.5kW CO2 model LT20, let them process tubes up to 20” diameter and 50’ long with wall thicknesses of up to .625”.

In 2014, Tubilaser purchased its first fiber laser, a LT14 (14” diameter) equipped with a 3kW IPG fiber laser resonator. This addition enhanced their processing capabilities while adding more capacity for large diameter jobs.

The decision to use the laser cutting process for large dimension tubes was in part a logical decision because it allowed Tubilaser to satisfy their customers’ requirements but it was also a result of entrepreneurial intuition that Guido Bonaldo had nearly 15 years ago, much ahead of its time. He rightly realized the potential advantages offered by laser cutting process, even in cutting large tubes. These advantages weren’t as obvious at the time he made the investment. “Initially all the customers treated my decision to invest such a large sum for a machine as sheer madness” says Bonaldo referring to his decision to buy the LT20. “In the early days, we did not receive any drawings requesting we quote on large components or structures. We had to work hard with our customers engineering departments to convince the designers about the advantages of using the laser cutting process. These advantages were well known for smaller tubes but it took some time to convince the market that the same advantages were valid for larger, heavier tubes”.

Slowly the customers began to realize the benefits of laser cutting and started to implement innovative design solutions for their parts. Now, even for simple applications, the laser cutting process is automatically assigned. Flavio Colusso, Tubilasers’ production manager, explains it this way. “The advantage does not lie in the
 automation of the manufacturing process for a single component, but they cover the entire production process for a given project and that results in the overall lower costs compared to the traditional processes” says Flavio. To explain his point he gives this example. 

**Let us consider two 40 feet long, large diameter round tubes. These tubes are to be end-cut to form a 90° joint between them and they also have other pockets to be cut along their length where additional tubes are to be inserted to form a tubular structure. Now you will appreciate that these pockets have to be cut with correct orientation with respect to the end-cuts; a small error, even of one degree in terms of orientation, will cause considerable mismatch at the other end of the tube. Such errors are common when fabricating with traditional manual processes. The time required to rework the parts (often in the field) to correct these errors can be almost infinite. The LT JUMBO family of laser tube machines can produce these types of large tubes in a single, completely automatic cycle with an accuracy and repeatability that cannot be matched by the old manual processes.**

The 3D tilt cutting head of LT14 can move along the full length of the tube as it is being held by two rotary chucks. This approach offers high precision and flexibility in cutting the ends or pockets anywhere along the full length of the part. “All our customers are extremely satisfied with the precision and the quality of components that we supply” confirms Filippo Bonaldo, the founder’s son. Thanks to the laser cutting process, Tubilaser is in a position to supply high quality components with short lead times and low costs. This is a huge advantage when customers.

**With traditional methods, the total time (and hence cost) required to produce a given component can’t be determined in advance because it depends upon a number of factors, the most important of which is the operator skill** says Colusso.

**The situation with laser is different. The cost and time required to produce any given component, even with bevel cutting required as joint preparation for subsequent welding, can be calculated in advance. This calculated cost remains the same whether you produce one component or hundreds of them. This certainly about the cost and quality is highly appreciated by our Customers.**

“An example of one such successful project was the fabrication of complex tubular structures for railroads. These structures are installed along a railway line and are used to hang signals and other indications for trains. These tubes were laser-cut and then sent to the site, ready to be assembled. No further adjustments or any kind of rework was required during their assembly and the structures were assembled like a puzzle” says Bonaldo. He continues and touches another important aspect, “The operator skills in the traditional processes are not the same as they were once upon a time. In the past, an operator was capable of producing a component on his own once you gave him the drawing. New workers don’t have the same skill set. Any mistakes made are very costly because either you have to spend a lot of time for rework and repair or scrap everything and start anew. Since material cost for large dimension tubes is very high, one can’t afford to do this”. Using a fiber laser on the LT14 was also not an obvious choice because the machine was designed to be used for large diameter tubes with thick walls and we all know that the fiber lasers offer an increased cutting speed when used to cut thinner materials. The fiber laser was chosen for its overall lower operating costs. “The tubular construction and agricultural machinery sectors are extremely cost sensitive. Fiber laser technology with its lower energy consumption (and hence lower installed power requirements) and lower maintenance helps to reduce the cost per piece. It also adds the capability to cut other materials. This expanded capability is an important factor for any tube fabricating job shop. These advantages amply offset the small compromise that we have to accept with the quality of cut surface obtained” says Bonaldo. In fact, compared to an installation with a CO2 laser, the electrical power requirement is almost half, there is practically no maintenance required on the laser resonator because there are no moving parts in the fiber laser, there is no chain of mirrors to guide the beam and hence no question of their alignment, cleaning and maintenance. With a CO2 laser all these maintenance activities result into stoppage of machine and loss of production. In addition to that, fiber laser has an additional stand-by power module inside the fiber laser that kicks into action in case one of the operating modules should have some problems.

The use of fiber laser technology compels the machine manufacturer to completely enclose the working area to ensure operator safety. On the LT20 the laser cutting process is viewed via video cameras installed in the working area. Bonaldo considers this aspect as a plus. “Since the working area is totally enclosed, the machine manufacturers have to pay extra attention to make certain the machine operation is more reliable and capable of resolving eventual hiccups in an automatic manner, as much as possible” says Bonaldo. An interesting point of view!

We can conclude that the challenge of using laser cutting process for cutting large dimension tubes has been overcome. There was some reluctance in the beginning but now Tubilasers’ customers have understood the advantages of having accurate, high quality components that can be easily assembled and welded on site and hence the laser cutting process for such components has become their new standard. The designers working in this Industry have also learned the potential new design freedoms offered by this technology, and they have started to use it freely to design innovative structures that are aesthetically pleasing.
CAPACITIES
- Weight capacity up to 40 kg/m.
- Machinable diameter up to 240 mm.
- Efficient fiber 3D cutting, also on very thick steel parts.

AMAZING PERFORMANCE
The LT8.10’s unique parameter control, determined by the speed, material type and features to be cut, allows you to finally cut THE WAY YOU LIKE, automatically!

You will be able to cut AT PRECISE POINTS.
An non-contact optical device ensures real-time detection of the tube shape and position of the bar to be machined, and corrects positioning in real-time.

EASY TO USE
Programming with Artube 3 guides you to the right technical solutions based on processing to be carried out; it shows you at every stage only the applicable operations. With a few clicks drawings of individual parts or entire assemblies are turned into optimized programs for the machines. It easily imports 3D CAD (in commonly used formats) lets you apply changes for the laser cutting without ever starting design.

Moreover, a new graphic interface will allow you to minimize both the time and the errors in terms of machine control, thanks to state-of-the-art ergonomic features.
Established as a small-size metal fabrication shop specializing in the end forming and welding of tubes intended for FIAT Trattori, SAG Tubi has evolved into an industrial group employing over 1,000 workers and including a dozen companies that operate in several fields (e.g. automotive, ship building). SAG Tubi has, from the very start, closely collaborated with BLM GROUP, from which they have recently purchased a Laser LT-FREE system used for laser cutting curved tubes.

SAG TUBI

THE CHARM OF THE CHALLENGE

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The Group’s companies include ANSA, the well-known exhaust manufacturer that has been acquired and renovated. “We only manufactured tubes, so we were a minor player in the exhaust system process. If you deal with mufflers, you deal with the entire process, and the people at Ansa are capable of designing any type of muffler,” Mr. Zini commented. UNIFER manufactures drilled exhaust baffles for mufflers and supplies them to the main manufacturers of automotive exhaust systems. Sagom Rubber manufactures molded rubber items. SAG Tools manufactures the control gauges and tools needed for all the machines produced by the Group. UNIFER Navale manufactures nautical tubing and has therefore expanded the business opportunities to this sector. Finally, SAG Tubi AIT (Advanced Insulation Technology), a company manufacturing...
tube and pipe insulating items, is being acquired, considering that
the tube and pipe insulation sector is becoming more and more
important worldwide.

“We make 12,000 parts per day of bent, shaped, welded and coated
tubes, to be supplied to very demanding customers that operate in
many industrial sectors: automotive, trucks, earthmover piping, fork-
lift trucks, farming machines (40-45% of the total turnover), sports
vehicle, motorcycles and earthmovers. About 50% of our turnover
originates in Italy and our customers include FIAT (which accounts
for 60% of the turnover), SAME and Caterpillar.

The group’s companies boast extensive know-how and a wide range
of tubing products, i.e. from the mixed hydraulic tubes intended
for low and high pressures uses to the comple exhaust systems
with shields and insulation, mounting hardware, automotive
cooling pipes and baffled muffler pipes. “We like to stick our nose
in all sectors’ design, from the brake piping to the cooling systems
intended for large-sized engines. Thanks to the experience gained
in the past, we can propose solutions and provide technological
support to companies, if required, for both hydraulics and the
exhaust systems. For instance, we have recently visited Rotax, a
company that manufactures ultralight aircraft and suggested that
they should bend their exhaust tubes instead of welding them”.

As far as production systems are concerned, we have already pointed
out that the business relationship with BLM GROUP were established
a long time ago. When walking along the corridors of the Novellara
plant, we felt as if we were visiting a BLM GROUP showroom, due
to the number of bending and end-forming systems installed there.
Mr. Giuseppe Zini had started by bending the hydraulic pipes and
tubes used tractors (which feature a diameter of up to 30-35 mm)
by using a BLM B40 machine; then, he purchased a B90 machine
in order to bend the larger tubes and pipes intended for cooling
systems. Next, more sophisticated machines became available to Mr.
Zini’s company, i.e. the E-BEND90 multiple-radius machine, which

“Regarding tube bending, the technological landmark was the
introduction of electric machines,” Mr. Zini explained. “Hydraulic
machines posed some problems especially because they did
not make it possible to bend certain radii. When BLM GROUP
launched the first fully electric machines, we replaced all our
bending systems in just a few years, since the advantages given
by the electric machines were huge. Today we can bend tubes with
1D BEND RADIUS, even in case of large diameters, e.g. 139 mm
(thickness: 1.5)."
To do this, you will certainly need the ‘right’ machine complete with the latest software and all electric axes control. At the same time, extensive experience is an essential requirement: you have to understand how to bend difficult materials before you have to bend and the tube breaks in the end. Money cannot buy this know how: you have to gain extensive experience, you cannot buy it!\[12pt\]

The latest purchase is, however, different: it refers to a 5-axis laser system used to cut end-formed parts, i.e. the newly-designed LT-FREE model that has drawn Mr. Zini’s attention. “We got the LT-FREE machine in September 2015. An excellent piece of machinery, yet we still have to ‘play’ with it in order to make the best use of it. The 3D laser technology is a recent entry in the marketplace, especially as regards tubes and we mainly cut curved tubes.” As a matter of fact, the LT-FREE is a 5-axis system designed to machine both the conventional hydroformed, drawn components and the curved tubes. The availability of robots to handle the parts ensures a degree of flexibility that could not be conceived of in other systems of this kind.

SAG Tubi did already have a laser machine available to cut the tubes, yet it was quite simple and not very flexible. “That machine posed some limitations: sometimes we had to move a tube from one template to another one, to be able to finish the tube. We make about 250 different parts each month, which feature diameters ranging from 4 mm to 150 mm, so we needed an extremely flexible system”. “When I first saw the LT-FREE machine three years ago, I quickly realized that it would be the perfect solution for the tubes we machined, i.e. quite complex tubes with complex cut patterns. By combining the five axes of the fiber laser head with the six axes of the robot, the system’s flexibility can be guaranteed. Two work cells are available, which means that you can work in one cell while loading the other cell, in a very efficient way. The fiber laser device takes care of the rest, working at a speed that is nearly twice the speed reached by the CO2-based devices. It follows, as a matter of fact, that we have halved the processing time on some types of tubes,” Mr. Zini stated. “The advantage given by the laser system mainly depends on the operations to be performed on the tube; for example, if you only have to trim, other solutions are available (they are not so fast but they are likely to be cheaper). However, if you have to make several cuts and drill holes of different size and shape - and if you consider the quality of the part - then the laser technology has no rivals. We started machining the parts from the greatest production volumes; yet, we are now transferring the entire production to the laser system, also because we have found significant advantages from the logistic viewpoint, in addition to the cutting process speed”. Finally, we asked Mr. Walter Zini what the strength of the SAG Tubi Group was. He replied that he can rely on the workers’ passion and dedication to their job, adding that he can rely on extensive technical experience gained in the workshop during many years. “I inherited my passion for mechanics from my father. When I was a child, I liked to visit the factory, after I had been at school, and learn to weld and machine the metal tubes.” Then Mr. Zini told a story that reveals what is probably the secret of his own success: “I have always been drawn to challenges: some time ago we had to produce a very difficult curved tube, everyone said the tube could not be bent and suggested that two welded shells should be used instead. Well, I started working, together with production manager Mr. Italo Deda, on the BLM GROUP’s tube bending machine and in the end managed to get the finished tube!”.

"The integration of the BLM GROUP’s products (i.e. tube bending, end-forming and laser systems) with one another, resulting in a full manufacturing processes. This marriage helps optimize a production line, by simplifying or eliminating the material handling between manufacturing operations and eliminating work in process inventories and its related floor space. This is the case with the exhaust tip which is bent on an E-TURN52 system, end-formed to expanding one tube end by means of the AST-5 system and laser-machined on the LT-FREE 5-axis system.\[12pt\]

TUBE TECHNOLOGY

50% reduction of production times

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Let’s change our perspective.

Up until now, we have always thought that working from coil should just be used for pieces that do not have tight tolerances or stringent cosmetic requirements. But the demands are changing: they are asking for tighter technical parameters, more stainless steel tubes, and more aesthetic requirements.

Take a look on our solution:

**REDUCTION OF CYCLE-TIME AND PIECE PART COST**
Some process steps can occur within takt time. It provides you with a much higher productivity rate than with sequential operations.

**AESTHETIC PIECES**
You can develop quality parts with tough geometries: with very strict minimum radius and very thin wall and more difficult material such as stainless steel.

**USE OF STANDARD MACHINERY**
Rather than using specialized custom equipment to make your parts you can use standard machinery. That means you get the flexibility to repurpose the machine for future projects thus saving your capital expenditure.
Fracino’s success in broadening its European and worldwide horizons reinforces that manufacturing in the UK can be, and is, globally competitive albeit with a little help of an Italian-built BLM 4-RUNNER All-Electric CNC tube bending and end forming machine.

The multi award-winning, third generation family business is marking 52 years in business after being founded in a garden shed in 1963 by Frank Maxwell, a former machine tool designer with the Alfred Herbert company. His passion for coffee came from holidays to Italy and led to a successful business importing and selling coffee machines to catering establishments around the UK. In the late 1980s Frank was joined in the business by his son, and current managing director Adrian Maxwell, a former Rolls-Royce engineer – bringing a powerful combination that took the business to new heights. Turnover doubled and the business gained the accolade of being the second best distributor, worldwide, for the Spanish coffee machines that it was importing. However, demand began to outstrip delivery, a situation that led Frank and Adrian to look at manufacturing their own range of machines.
Manufacturing in house turned out to be the best decision we made. In the first year we produced 30 machines - all of which were sold within the UK. Orders were growing and we took advantage of the weak pound - which resulted from the financial collapse of 2008 - as an opportunity to launch an export arm. We focused our marketing messages on the British values of quality build, durability and reliability – based on the fact that the first machines we ever built were still in good working order and we were confident to promote that Fracino coffee machines, made in Birmingham, are the finest in the world. This strategy, combined with our investment in manufacturing, ensured we would remain competitive with our global competitors, with our machines selling for between 15 to 20 per cent of comparable equipment, in spite of the current strength of the Pound” says Adrian Maxwell.

The success of this export initiative has seen Fracino double its turnover to over £4 million since 2008 - currently producing in excess of 4,000 commercial and domestic espresso machines a year. However this strong sales growth also brought production issues and challenges with a large volume of manufacturing - including much of the tube bending for the water delivery systems in the coffee machines - having to be subcontracted. “We recognised that we needed to bring this work back in-house in order to control lead times and quality, so we purchased a new building next to our existing site, which doubled the size of our premises, and created a sheet metal and tube working facility over a 12-14 month period. Our tube bending initially consisted of a manually loaded machine, but after a visit to Italy, where we saw the benefits of the BLM automated system, we placed an order for the 4-RUNNER machine”.

The BLM 4-RUNNER is a complete tube bending, end forming and swarfless cutting cell in one machine, taking tube directly from coil and straightening it prior to processing it - with up to six ram-forming passes, bending, cutting and controlled unloading of the finished part. It can form bends with fixed or variable radii and the end-forming can be a combination of ram and rotary forming passes. The key to the machine’s success are the significant gains in productivity that result from combining these processes into an automated cycle. “The introduction of the BLM 4-RUNNER has revolutionized our tube production. Tubes that used to take 3.5 minutes to process on our old machine are completed in 15 seconds now. The speed is incredible, so much so that we have moved from a bottleneck situation to being in a position where we don’t have to run the machine every day as it keeps us ahead of the build schedule” adds Adrian.

As well as dramatically lowering cycle times, problems of lead times on material have been eliminated by switching from straight tube to coil. The machine’s efficiency has likewise been boosted with a 20 per cent reduction in waste material - and time saved in changing over from one job to another has also fallen considerably. These reduced set-up times are aided by the BLM 4-RUNNER’S ability to store the position and settings of each electric axis along with the part program, eliminating any adjustments when changing batches. The manufacturing environment also benefits from the BLM 4-RUNNER’S technology, with all-electric axes eliminating the need for hydraulic oil and generating electricity savings of up to 80 per cent when compared to older tube bending systems.
With a history that can be traced back over 125 years, through four generations of the Hudson family, the modern day Gratnells has consolidated its position as a leading supplier of storage, furniture and staging to schools, industry and the medical sectors. The Harlow, England-based company is now embarking on its next technological leap, using technology from BLM that would have even been beyond the imagination of H G Wells, who published his classic work of science fiction The Time Machine, in 1895, the year that Gratnells was founded as W A Hudson.
The decision to install a BLM LT5 Tube Laser machine, the first in the UK, is further revolutionizing Gratnell’s business to meet the increased demand for its tray storage products for schools, industry and the medical sector, which were currently being produced using manual machine technology. “Within a very short space of time of installing the BLM Tube Laser we were seeing productivity doubling. Batches of racking that would previously have taken two people, two days to complete are now being produced, mainly unmanned, in less than a day” says Murray Hudson, Gratnell’s Managing Director. “Not only that, but we are now able to process shapes on tubes that would have been impossible to achieve previously and this has led to innovative new product designs that will have significant impact on the market. The speed at which the BLM LT5 operates has also created extra capacity, which we are able to offer to those in need of quick response for low volume laser cutting”. The arrival of the BLM Laser Tube machine has not only improved productivity, but has also taken the business in directions it hadn’t originally envisioned.

However, there is one area that is of particular interest, that of motorsport. Murray Hudson’s son Rory is among the top 10 Kart racers in the UK and has been selected to be part of the McLaren Performance Academy, in fact he is the only UK driver on the programme at the moment. “It was the connection between BLM and Tony Kart in Italy, whose karts Rory drives that sealed our interest in getting the BLM LT5 machine. All of the Tony Kart chassis is cut and bent on BLM machines and having this information has enabled us to work with two universities, manufacturing the chassis for their Formula Student cars. The LT5 is allowing us to achieve multiple angle cuts that in turn create complex joints on these chassis that we couldn’t achieve without the laser. Working in a racing environment breeds quality and while motorsport is just one area that we can see potential for our laser cutting service the potential is huge thanks to the capability of the BLM LT5”, says Murray Hudson.

The move from manual slotting and cutting of tubes to the use of the BLM LT5 Tube Laser has been a massive leap forward in technology for Gratnells, but one that is paying dividends, as it now has the capability to quickly, and efficiently, process batches of any size tube, within the machine’s range of round tubes up to 120 mm diameter, squares up to 100 mm, and rectangular, oval and elliptical semi-flat stock up to 120 x 70 mm. It also has a capability to cut wall thicknesses up to 6 mm mild steel, as well as processing stainless steel, aluminium alloys, copper and brass.

As a result, Gratnell’s has created a business within a business, namely Gratnell’s Laser Cutting, to provide laser cutting for small to medium batch quantities with rapid response. Typically, the type of work that wouldn’t be commercially viable for traditional sub-contractors to accept. “We justified the purchase of the BLM LT5 on the work that it would be undertaking on our products, so any spare capacity that we have available after that is already costed in. This allows us to be very competitive in the sub-contract market particularly for short batch runs where the customer needs the work done in short lead times. We are not looking for large batch work as we do not want to commit the BLM LT5 to extended periods on sub-contract work as the main focus remains our own products, but this spare capacity does allow us to provide a niche, bespoke, service for customers” says Richard Picking, Gratnell’s International Marketing Director.

The installation of the BLM LT5 Tube Laser machine is just another step in the 125 years of development at Gratnell’s. The company has constantly evolved, moving from manufacturing metal cornice poles and curtain fittings, cornering the market for television stands in the post war boom years and being one of the first businesses to develop flat pack wardrobes. It was the latter that paved the way for the current business success, as each wardrobe Included slotted frames to allow shelving to be positioned. When schools changed their curriculum to include more science experiments by pupils, Gratnells (as it was now known) saw the opportunity and grabbed it. They took the design of the wardrobe shelving system, added standardized plastic trays and the result was that the company became one of the largest suppliers of storage systems to schools. Current production stands at 10,000 plastic trays per day that are shipped worldwide along with their associated shelving.
The company was established as Matthey S.r.o. in 1967 and soon became one of the main manufacturers of welded stainless steel tubes to be supplied to the automotive exhaust system market. Matthey joined the Arcelor Group in 2002; two years later, it opened the factory at Usti nad Labem to provide services and assistance to the customers that were moving eastward in the wake of the automotive market.

Since 2008, the company name changed first to ArcelorMittal Stainless Tubes Automotive Republica Ceca and, then, to Aperam Stainless Services & Solutions Tuba CZ s.r.o. (Aperam Usti).

We met Mr. Jaroslav Sečanský, the company’s production manager, on his last work day at the company itself, as well as Mr. Lukáš Terč, who replaced Mr. Sečanský within the corporate organization. They both described how the production department has evolved: “At first the work involved cutting to length tubes that were imported from Switzerland and were used only for the automotive exhaust systems,” Mr. Sečanský said.

Then, the tube mill lines (to manufacture welded tubes in-house) were built; next, the service centre unit developed, i.e. the tube fabrication department including the tube bending machines and slotting machines.

Reference is made here to stainless steel tubes with a size of 10-90 mm, intended for exhaust systems. “We manufacture only tubes, not full assemblies, which are instead manufactured by our customers that represent all major Tier 1 companies in the automotive exhaust system field, for instance Faurecia and Tenneco, just to mention two famous companies operating in this field,” Mr. Sečanský added.

At first, the sawing lines (i.e. four automatic sawing machines) had been imported from Switzerland. Today, eleven sawing lines are available, which allow us to manufacture about 4 million pieces of stainless steel tube each month: our production rate has increased eight fold since 2005.

“We first contact with BLM GROUP dates back to four years ago, in connection with a tube bender to be used in the tube fabrication department”. We spoke to the woman in charge of managing the tube bending department: „...”

The Aperam Group is a global player in the stainless steel field, with a portfolio of customers located in more than 40 countries worldwide. “Aperam Stainless Services & Solutions Tuba CZ” is one of the Group’s company, featuring an historical and significant tradition in the manufacture of pipes and tubes for automotive exhaust systems. The introduction of a Lasertube LT5 system has improved the efficiency of the company’s tube cutting department.

“...”

Ms. Wiedemannová concluded.

Then, Mr. Sečanský started talking: “We noticed that the tube bending machine performed well and had therefore been a profitable investment, so we held BLM in higher and higher regard, until when we became seriously interested in the laser cutting technology. However, all the calculations we had first made showed that the laser cutting technologies were not cost-effective in connection with our needs. The overall process proved to be slower than when operating the sawing machines and, above all, the initial investment for purchasing the system was too costly and we were also convinced that the operating costs would be excessively high as well.

Next, ADIGE presented the new Lasertube LT5 TQR model, a version
expressly developed for straight cut off on round tubes; the new calculations made for this version showed a different result, i.e. they presented quite a cost-effective option. "The LT5 system was more productive and cheaper. Its main advantage came especially when cutting stainless steel: in this application, the performance achieved by cutting with a saw blade was not enough, owing to the intrinsic features of stainless steel", Mr Sečanský explained. All of this took place very quickly: after we had witnessed the actual machine operation at a trade fair, we requested suitable verification tests that confirmed the system’s productivity as well as the quality of the manufactured parts, which eventually led to the decision we made. “Our predictions were confirmed by the system’s real operation: the difference against the initial theoretical calculations amounted to very few percent points. The production levels for the LT5 are approximately 30% higher than the fastest sawing machine we had considered. Moreover, you should consider the reduction in the operating costs of the machine, the electricity consumption of which is lower than a conventional sawing system. Of course, this comparison has been made with a cutting line complete with the measuring, brushing and washing devices”.

“The LT5 system is used to a very large extent (i.e. 95%) on stainless steel, which guarantees a higher gain against the sawing machines. We do not only perform straight cutting operations: yet, we are presently restricting the requests we have received for additional machining”, Mr. Terč explained. From the business viewpoint, we anticipate good opportunities of expanding the range of products and services Aperam Usti is able to provide, yet there are two different reasons for which we have so far proceed with the utmost caution. “First of all, we receive so many orders for straight cutting only: this is the first reason why we have declined the use of this machine for different types of cutting” Mr. Terč said. “The second reason is that we do not have a back up machine: should the only one machine available stop, we would not be able to produce the laser trimmed parts by means of any other machine and, therefore, we would not be able to cope with the job orders”. The most significant advantage we at Aperam Usti have noticed concerns the process as a whole, instead of the individual machining operation. “We simulated the total cost of the cutting department in the event that a new sawing machine was operated, then we compared such cost with the actual cost of the department after the LT5 system had been introduced. The result was quite surprising since the introduction of a laser system in place of a traditional sawing machine (in a department where 11 more sawing machines are available) amounted to a few percent points (approximately -5%) over the total cost. A significant portion of this saving results from the operating costs, which proved to be significantly lower in case of the laser option.

The satisfaction found in purchasing the LT5 system is evident, even when Mr. Sečanský reported that the machine laser operations are carried out quite simply. Of course, we are not referring to programming complex operations; on the contrary, the mere straight cutting operation can be easily managed directly from the machine control without the need for special programming.

To sum up, we are glad to reassure Mr. Sečanský and Mr. Terč that a solution to their only problem—the problem of expanding the market opportunities (i.e. the lack of one second system) can be solved!
EXPERIENCE

Centro Laser is a company specializing in sheet metal and tube cutting. It is based in Santorso (Vicenza, Italy) and is one of five divisions of the SOVEM Group. The Group provides a full range of metal fabrication services including cutting, metal stamping, heat treatment, welding, and assembly.

JOB SHOP

In 1977, four craftsmen from the province of Vicenza (Italy) decided to join together to form a welding job shop and established SOVEM S.r.l.. Over the course of time the company’s activities expanded from its early days of just welding. Its first major investment was an automated punching machine back in 1986. Today’s SOVECAM, through its five divisions employs 65 workers, and an annual turnover of €10 million.

“SOVEM generally operates as a subcontractor servicing local companies to which SOVEM supplies metal components and assemblies intended for various industrial sectors: construction, medical, textiles, packaging, energy, food, and so on,” Mr. Siro Viero (a SOVEM’s partner) explained, together with Mr. Dalla.
Costa, another partner, who added: “The SOVEM companies mainly consist of fabrication enterprises specializing in specific machining operations such as cutting, bending, welding, finishing, heat treatment and assembling”.

Centro Laser S.r.l. came into existence as a cutting department within SOVEM and, then, was spun off the latter to become a separate enterprise on its own with a different business name. Mr. Adriano Giacobbe, the managing director, told us about the company’s early days: “We purchased what was probably one of the very first sheet metal laser cutting systems in this area: no similar equipment was available locally and the only option at that time involved travelling all the way to Padova or Verona to find another laser cutting shop”. That really hit the nail on the head! Centro Laser purchased a reconditioned, second-hand ADILAS sheet metal laser cutting system.

The collaboration with BLM GROUP stimulated the interest in metal cutting system. Centro Laser purchased a reconditioned, second-hand ADILAS sheet metal laser cutting system. In 2007. “Jumping directly into a dedicated Lasertube system would have been unadvisable,” Mr. Dalla Costa remarked.

Mr. Dalla Costa has analyzed the same issue from a different viewpoint, by stressing the development of the needed professional skills, from the workshop fabricator who cuts, welds and does the labor, to the programmer who, at an earlier stage, draws the parts by means of CAD/CAM software and prepares the job orders for the automatic production systems. The old-time fab shops, where bars were cut by using a miter saw cutting to 45 degrees, to make frames, have evolved into the present-day laser cutting systems that make joints automatically; at the same time, the professional skills have changed and most of the job is now done in the office, where the job orders are prepared and developed and where the efficiency of the manufacturing process is the ace up the company’s sleeve.

The above remarks provide the reason why BLM GROUP makes a great effort to provide the software applications aimed at making the operators’ programming work easier.

The ADIGE-SYS’s LT COMBO machine started working in 2004, devoting 95% of its processing time to machine sheet metal; yet, it progressed within a couple of years to cutting tubes 50% of the time. “The laser applications fully transformed the cutting technologies, by replacing such tools as the shearing and punching machines thanks to their superior cutting quality and speed. In addition to the above, the combination machine, featuring tube laser machining, has further expanded the size of our markets,” Mr. Giacobbe explained.

Mr. Viero stated that the “old fashion skilled metal fabricators” can’t compete with laser. The fiber laser has opened new opportunities both for tubes and sheet metal fabrication, and the water-jet cutting method is now used only in cases where the thermal heat affected zone, even of a small extent, cannot be tolerated.

The SOVEM companies mainly consist of fabrication enterprises specializing in specific machining operations such as cutting, bending, welding, finishing, heat treatment and assembling”. Mr. Dalla Costa remarked. After the LT COMBO machine had been introduced, new opportunities arose, which proved to be significant both for tube and sheet metal processing: the possibility of cutting highly reflective metals, the system speed and low consumption are major features as regards both tubes and sheet metal. Indeed, using the fiber laser technology only on tubes would involve some restrictions, since the fiber-based technology is nowadays a valid option for sheet metal as well. The ADIGE-SYS’s LCS combination laser system was determined to be the perfect solution that allowed us to make use of the fiber laser source to machine two different types of items (i.e. sheet metal and tubes).

The LCS system allowed us to increase our production levels both for tubes and sheet metal. For instance, when machining grids that used to be produced thousands of pieces at a time, the time needed for machining one single part has evolved, thanks to the LCS system, from more than 6 minutes to less than 2 minutes.

Currently, we employ the fiber laser technology to cut copper, aluminum and brass. The market has transitioned. In the past these materials used to be cut by means of the water-jet; which today could not compete with laser. The fiber laser has opened new opportunities both for tubes and sheet metal fabrication, and the water-jet cutting method is now used only in cases where the thermal heat affected zone, even of a small extent, cannot be tolerated.

The LCS system is highly versatile,” Mr. Giacobbe stated. “This versatility is of the utmost important to us: we act mainly as subcontractors and, typically, we may happen to change between manufacturing processes up to ten times a day, i.e. we may need to shift from machining a piece of sheet metal to machining a tube within a very short time, or even stop machining sheet metal and start machining a tube and, then, resume the sheet metal machining; all of this is no doubt invaluable to us. Yet we had a doubt about purchasing a combination machine, i.e we worried about having dual capability but being only to use one at a time, in any case, flexibility is in fact the essential feature and the combination machine is actually used for different markets, thus providing greater business opportunities by means of one single system.”
The software used to support the operation of a production system such as a Lasertube system or a tube bending system has significantly evolved during the past few years. The CAD/CAM systems, used to design and draw a part and create a program have given way to increasingly complex software application packages that perform different functions both in the office and on the machine itself. To properly take stock of the state of the art in this interesting world, we have asked a few questions to Dr. Paolo Benatti, ADIGE’s Technical Manager and an expert in this field.

**TECHNOLOGY**

**FROM CAD CAM TO BLM ELEMENTS... WHERE ARE SOFTWARE PACKAGES HEADING FOR?**

**INDUSTRY 4.0**

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**INDUSTRY 4.0**

The machines that implement flexible production processes can now be programmed in a flexible way: this is the area where the newest software developments can be seen. The CAD/CAM systems (initially 2D, then 3D) have solved the problem of generating the programming languages needed for a particular machine tool, which required an operator/programmer, with a system able to automatically generate the machine instructions by starting from just a geometric description of the part to be manufactured.

Then we realized that the production system programming represented only the first step of a manufacturing process that includes a number of activities which can be supported by adequate software applications. We are referring, for instance, to simulating the machining operations in order to check the part feasibility (e.g. in case of bending operations) or to get information about the time needed and the cost to be incurred in order to manufacture one single part or an entire production batch, or to machine either one single part or an entire structure or frame consisting of several elements, in a simple and intuitive way. Finally, integration with the machine control system is a requirement.

All of the above needs are now considered as requirements by the BLM GROUP’s customers. All of these features available within the different applications within the BLMelements software suite: Artube, VGP3D, PartViewer, Composer, Protube.

**Why did ADIGE develop a CAD/CAM program of its own dedicated just for tubes?**

When ADIGE took the decision to develop a CAD/CAM program of its own, no good option was available in the market for the graphic programming of Lasertube systems. Yet, the main reason that persuaded ADIGE to invest in such a challenging venture was based on the understanding that the CAD/CAM design represents, in case of Lasertube systems, an essential feature of the machine operation, in addition to being a programming tool.

The programming of systems intended for sheet metal laser cutting entails a clear-cut subdivision of tasks between the part nesting phase and the identification of the cutting path (i.e. operations carried out off-line) and the identification of the cutting conditions that will be used on the machine. In case of laser tube cutting, the combination of these phases is very strong and very difficult to be disentangled, due to the fact that the way a tube is handled will affect both the system performance and the quality of the finished parts to a significant extent. Moreover, some functions cannot be solved entirely either off-line or on the machine itself; therefore, taking control of both such functions is the only efficient way of guaranteeing top performance levels.

This is the reason why Artube 3D was designed: a tool expressly developed to meet the requirements of many laser systems of the BLM GROUP’s Lasertube family.
nobody will need to worry about efficiency any more, since the quality. To sum up, both the experience and the skills lie with the influence and any risk of collision, damage, shut-down or poor performance and quality characteristics, without any external are smart enough, on average, to obtain a part featuring superior system. Operators are not particularly interested in the machine processing of a 3D model after the latter has been fed to the cutting latest developments follow a direction characterized by full increasing transferring the “intelligence” (i.e. skills) peculiar to the operators, who took an interest in understanding the operation of the systems by means of the ‘cut-and-bend’ approach and fastened by means of a weldless joint. In any case, a number of similar solutions have already been implemented. A sufficient amount of “intelligence” has been transferred to the latest version of Composer software. A curved tube is now seen as a frame made up of segments connected by joints, thus offering a wide range of possible solutions from which the most suitable one for a specific requirement will be chosen. The operators will no longer connect, join and bend the items by drawing lines or areas: on the contrary, they will make use of pre-defined features, i.e. shapes that incorporate the knowledge of what a tube is and of how it should (or should not) be handled, cut and bent. From the management viewpoint, Protube is a system able to independently manage the production of the Laserube systems and also easily interface to the customers’ ERP systems. The subsequent step will be likely to entail massive utilization of the “cloud” feature. The information will no longer be available only on the customer’s LAN: some information will be able, after being duly filtered (depending on the customer’s needs), to be sorted out to standardized servers, so as to have a picture of the production progress status which can be shared with both by the customer and by our company (in order to improve our service levels). One example could be the comparative diagnostics that would make it possible to make a preventive diagnosis that anticipates the occurrence of problems (if any). Integrating different types of processing technologies: a topic dear to BLM GROUP: Where is it heading for? We are referring to parts requiring multiple manufacturing steps, i.e. parts that typically require machining operations in a sequence, (e.g. sawing, laser cutting and bending). In this case, the integration among different technology – a concept concisely expressed by the BLM’s slogan “All-In-One” – aims at considering a finished part as the only and one item deserving our attention, instead of being considered as the whole of individual machining operations that are managed separately. The ProTube application takes into consideration multiple machining operations. This part can be included in a production list dynamically created and managed by external ERP systems; therefore, external production job orders can be collected and production lists can be created or received, which will be subsequently split and grouped depending on the material types and shape, thus generating the job orders for the individual machines and ensuring the traceability of the machining operations carried out. During the programming phase, the cutting and bending platforms manage the exchange of the data needed to “bureau” the models: today we are able to import a model of a curved tube and straighten it to supply both the laser cutting machine and the bending machine with the correct data needed to process the item from the very first part. Data exchange takes place both off-line and on the machine itself: the extensive know-how relative to tube handling and machining has been transferred into these software applications. Of course, the ProTube application is capable of tracking back the production status for individual orders or the entire production list. So, the machines will also provide data of their actual utilization and of their reliability and productivity levels. All of the above represents one of the elements that have triggered the so-called “Industry 4.0” revolution, which merely entails distributed, massive use of Information Technologies within the production sectors, by providing information both to the Individual machines and the manufacturing process as a whole.