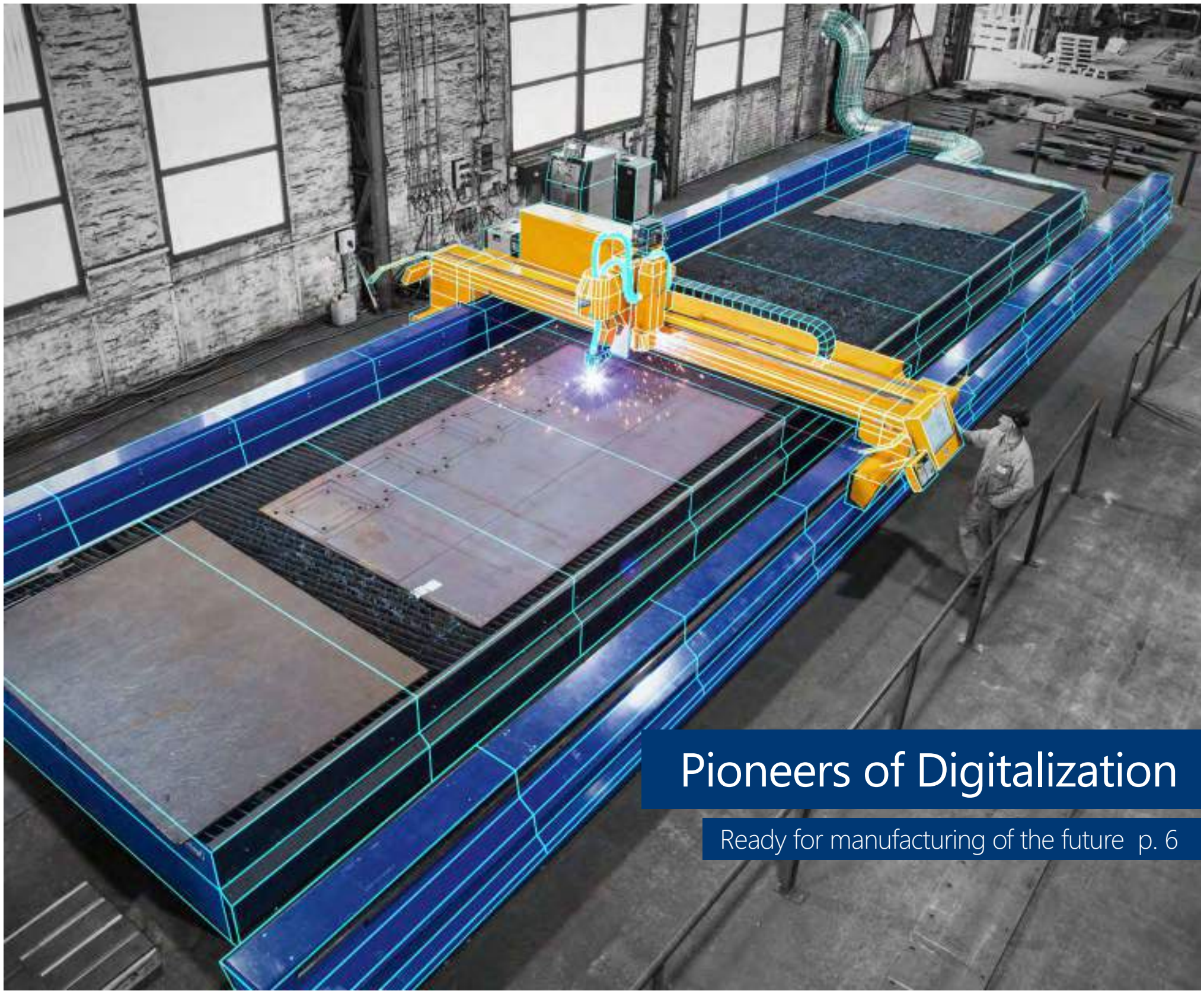
MicroStep®

SOLUTIONS



Pioneers of Digitalization

Ready for manufacturing of the future p. 6

A true multifunctionality:
Drilling and milling solutions

Produce your parts with already drilled holes, countersinks, threads, or milled openings and weld preps: supplementary machining technologies turn MicroStep cutting machines into multifunctional production centers!

p. 32

Automated dome processing:
Save valuable time now!

The basic step in production of pressure vessels is precise cutting of dished ends. Automating this process to a high degree while delivering high-precision contours without the need of additional surface finishing provides manufacturers with a clear advantage and saves them a lot of valuable time.

p. 38

Material handling:
Efficiency through automation

Automated loading, unloading, sorting and storage: MicroStep supplies a variety of solutions for unmanned material handling of sheets, pipes, profiles and beams. Both for laser technology as well as plasma and oxyfuel systems.

p. 8

The right **solution**

for every cutting task

2D cutting

Bevel cutting

Pipe & profile cutting

Dome cutting

Plasma **Laser** **Oxyfuel** **Waterjet**

Supplemented with additional technologies:

- Drilling, tapping, countersinking, milling
- Marking
- Scanning
- Material handling

www.microstep.eu

Headquarters of MicroStep in Bratislava, Slovakia is the home of company's extensive R&D teams working on integrated development of mechanical and electronic nodes of CNC machines and control systems.

"We provide added value"

Managing Directors Alex Makuch and Eva Stejskalová on the strengths and the vision of MicroStep

MicroStep is active in the cutting business already more than 30 years. During this time we have pioneered and successfully implemented a handful of novel solutions that helped improve end user experience: a control system interface running on proprietary OS, laser pointers for convenient tracking of cutting tool position, automatic plate edge detection, auto-calibration of bevel heads (ACTG®) that not only guarantees long-term accuracy but also immensely simplifies their maintenance, an auxiliary tool station axis for accurate parallel cutting, additional beveling process (ABP®) that brings great material saving especially for thicker parts (see p. 24 onwards), mScan technology for 3D mapping of real dome shapes, advanced remote diagnostic and remote control tools that reduce machine downtimes and many more. Several of our solutions are patented.

We are delighted that many of our ideas and visions find appreciation by the industry:

- to establish automated bevel cutting as the process of choice for all who require weld preparation on parts, not only in plasma but also for laser and oxyfuel – in the last 5 years over 50 % of MicroStep machines were supplied with bevel cutting technologies
- to deliver multifunctional solutions that streamline the production process and save time for our customers – almost 50 % of machines delivered in the last 5 years integrated several different technologies
- to make bevel cutting a simple, fast and reliable process with unified control for plasma, laser, oxyfuel and waterjet – our unified interfaces and patented ACTG® technology delivered with all MicroStep bevel heads make beveling with our machines a highly precise and stable process, without maintenance downtimes
- and many others: multifunctionality in laser cutting, large-scale fiber laser machines, ABP with all cutting technologies, automatic material handling systems

Our philosophy is to deliver machines that are not isolated tools but form an organic part of the production workflow by exchanging information, predicting breakdowns and automating the material flow throughout the customer's production cycle. For this we are taking our digital environment to the next level: the new generation of MicroStep control system highlights digitalization and comes with tools and applications that enable a seamless integration of our machinery into Smart Factory solutions.

Realization of complex projects depends on exceptional technical solutions, reliability of their operation and top-level service. Achieving of such goals would not be possible without a strong developer base, strong partnerships with our suppliers and global business partners and most of all with the valued members of our distribution network and our loyal customers. Together we make it happen.

We hope you find inspiration while reading our magazine!

MicroStep®

Alex Makuch
Managing Director
MicroStep

MicroStep®

Eva Stejskalová
Managing Director
MicroStep

MicroStep® SOLUTIONS

Index

MicroStep machines are ready for the manufacturing of tomorrow
Page 6

3D processing with plasma, laser, waterjet and oxyfuel
Page 24

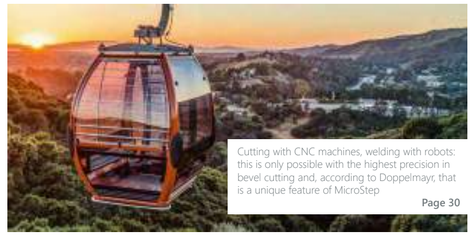
mScan: Unique technology sets standards in high-precision processing of dished ends
Page 38

MicroStep offers a variety of automation and material handling solutions for sheets, pipes, profiles and beams – an efficiency boost for your production
Page 8

Interview with Alex Makuch, Managing Director of MicroStep about plans, goals and challenges
Page 56

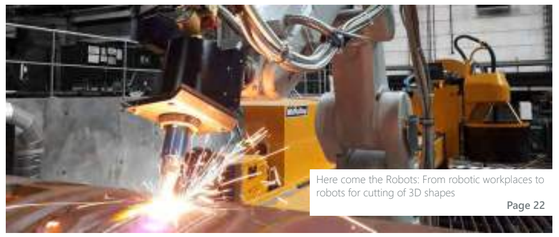
MicroStep and Terex supplied an automated production line to China's biggest mining equipment manufacturer
Page 18

NEW: A heavy-duty cutting, drilling and milling machine DRM Max
Page 33



Cutting with CNC machines, welding with robots: this is only possible with the highest precision in bevel cutting and, according to Doppelmayr, that is a unique feature of MicroStep
Page 30

MicroStep's MSF product line offers complete all-round solutions for fiber laser: versatile, multifunctional, automated
Page 46



Here come the Robots: From robotic workplaces to robots for cutting of 3D shapes
Page 22

Automation & Digitalization

Pioneers of Digitalization
Ready for manufacturing of the future 6

Efficiency boost through automation
MicroStep's automated manufacturing cells lay groundwork for connected factories 8

Automation systems
A selection of our automation solutions 12

Entering the 21st century at the speed of light
Swarco Dambach GmbH strengthens its machine pool with a fiber laser machine and an automatic material handling system from MicroStep 14

Automatic loader boosts production efficiency
More self-sufficiency for Hykemont: The Slovak producer of steel structures invests into an automatic laser cutting cell 15

Forty percent production increase
MicroStep and Terex have supplied an automated production line for the Chinese mining equipment manufacturer ZMJ 18

CyberFab Manager
Automating the production process on MicroStep machines 19

CNC cutting systems for large-scale applications
MicroStep partners with global welding automation expert Pemamek for advanced shipyard projects 20

Irving gears up with MicroStep
Shipyard invested in a 16 m wide gantry with bevel technology 21

Robotic solutions

Here come the robots
A broad portfolio: From robotic workplaces to robots for cutting of 3D shapes 22

Robotic pipe cutting
More flexibility for the Jan De Nul Group: An innovative combination of plasma plate cutting and oxyfuel cutting of pipes by a robot 23

Beveling solutions

"All expectations fulfilled!"
stürmsfs AG, one of the most modern steel and metal processing job shops in Europe, invested in a complex MG machine 16

Industry-proven beveling solutions
3D processing with plasma, laser, waterjet and oxyfuel 24

Additional Beveling Process
Efficient alternative to robots: MicroStep's patented ABP technology enables additional weld preparation directly on the cutting machine 27

Beveling going thick
Oxyfuel bevel heads opened up new possibilities in 3D processing of thick steels 28

Partnership with mountain conquerors expanded
Cutting with CNC machines, welding with robots: this is only possible with the highest precision in bevel cutting and, according to Doppelmayr, that is a unique feature of MicroStep 30

Drilling & Milling

True multifunctionality with machining operations
Drilling and milling solutions turn MicroStep cutting machines into multifunctional production centers 32

A custom MicroStep machine doubled the productivity at EBAWE
Manufacturer of complex production systems relies on a combined CNC drilling and cutting center from MicroStep – „The machine does exactly what it is supposed to" 34

Beveling and drilling are crucial
The job shop Prinzing invested into a plasma and oxyfuel combination with a handful of complementary technologies 35

Waterjet solutions

"A huge advantage!"
Eberle Metall relies on a MicroStep 3D waterjet cutting system to cut its wide product portfolio 36

A good experience
Metallbau Striegel have decided for a waterjet-plasma cutting combination with a pipe processing option 37

Dome processing

Dome cutting expert
mScan: Unique technology sets standards in high-precision processing of dished ends for less rework 38

MicroStep mCAM
CAM solution for cutting of 3D parts 40

"Now we prepare optimal products for pressure vessels manufacturers"
Bödenpresswerk Daaden has made a leap in terms of precision, portfolio expansion and production speed 41

Pipe & beam processing

3D solutions for steel constructions
Versatile options for beam and pipe processing: Automatic cutting machines for structural steel jobs 42

Market leader trusts MicroStep again
Pipe cutting solutions for the Chinese Gree Group: the world's largest manufacturer of air conditioning solutions 43

Multiplying the productivity
Euro Gas Systems, a modern European manufacturer of gas compression equipment, invested in a multi-functional DRM machine for cutting sheets, pipes, beams and domes 44

Fiber laser solutions

The fiber laser experience
MSF product line: versatile, multifunctional, automated 46

MSF Max a success at the traditional French cruise ship builder
MicroStep´s laser flagship with bevel cutting solution debuted with style in Chantiers de l'Atlantique 48

Flexibility for the requirements of today and tomorrow
Sealpac GmbH invests in a multifunctional fiber laser machine for 3D processing of sheets, pipes and profiles including material handling systems with a high degree of automation 50

"This is exactly the system we need, the precision is very impressive!"
MSF Compact: lower costs and more productivity for Metallbau Pfister 51

About MicroStep

Machine series
The right machine for every cutting task 52

Accessories
The right tool for every task 54

Continuously moving forward
Alex Makuch – one of MicroStep's three Managing Directors – about strengths, goals and projects of the globally active enterprise 56

MicroStep – 30 years of cutting and automation
Multifunctional CNC cutting, automation and digitalization solutions 58

The MicroStep World
Present in more than 50 countries worldwide 59

Pioneers of Digitalization

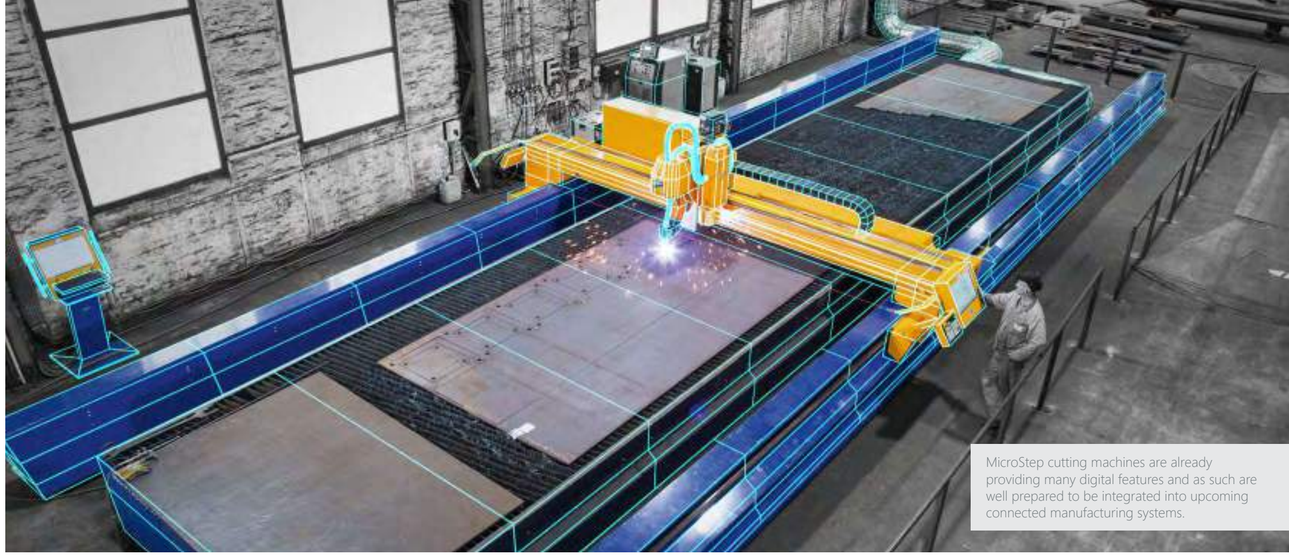
Ready for manufacturing of the future

As a manufacturer of CNC cutting machines and control systems, MicroStep has been consistently using the opportunities offered by digital technologies to help our customers produce more efficiently and competitively. With CyberFab® we bring our digital ecosystem one level up.

With the background of a multi-decade experience in control of industrial processes, both physical and digital, MicroStep has developed numerous useful technologies that are solving the practical issues of our customers – these would be unthinkable without mastering motion control and digital data processing. A few examples (see also p. 24 onwards): first of all, our patented auto-calibration system ACTG® that uses real-time movement compensation to ensure long-term accuracy of bevel cutting. Or, the sensor-packed Intelligent Torch Holder (ITH®) that monitors the torch position in all axes. Or our laser scanner-based applications that involve point cloud mapping of real surface shapes of 3D objects such as profiles, beams or domes to ensure high process accuracy.

Apart from that, MicroStep also already implemented quite a number of highly complex automation and material handling solutions in a variety of enterprises (see p. 8 onwards). These applications come in line with the general trends of automation and digitalization – that bring in turn the need for a more comprehensive approach to fabrication machinery in terms of production management, performance tracking and connectivity. To address these needs, along with the omnipresent, technology-fueled wish to produce faster and more accurate, MicroStep is set to launch a new generation of its control system – **CyberFab Control** – and a complete suite of tools and apps within its CyberFab® product family that streamline the operator experience, digitize and manage production machines and enable seamless integration of MicroStep machinery into Smart Factory solutions such as IndustryFusion – read more in the infoboxes below.

More info:
www.cyberfab.com



MicroStep cutting machines are already providing many digital features and as such are well prepared to be integrated into upcoming connected manufacturing systems.

Intelligent diagnostics

Augmented Reality tools increase the efficiency of onsite service calls.

With **CyberFab Diagnostics** we utilize predictive auto-diagnostics combined with remote access tools to enable targeted service interventions without the need of a prior inspection by a service technician – intelligent service and maintenance.

Based on monitoring, storing and analyzing the states of system components during operation, the collected data is used to plan maintenance and to create prediction models that enable more precise predictions of malfunctions not only based on the current state of a particular part but also of the system as a whole.

Workstation Manager

Workstation Manager module provides tools to control the complete process of manufacturing parts and assemblies in a single integrated system:

- Operators on workstations downstream of the cutting process receive task lists based on the current state of production that contain instruction sets for their specific operations and also information on parts flow
- Tasks can be either displayed on a screen and performed by human operators or directly interfaced to other smart equipment
- All completed operations are logged to ensure the production database is up-to-date at all times

Production

Automate and manage your production with **CyberFab Control** and **CyberFab Manager**:

- Benefit from shared technological parameters between your cutting machines – much faster production setup
- Configuration and production databases of machines shared with CyberFab applications – much more accurate evaluation of planned production
- Targeted system communication with users according to user competences – receive only messages that are relevant to your job
- Intelligent operator interface displays only the functional elements that are related to currently running processes – much more focused operation
- Maintaining quality and performance thanks to auto-monitoring and auto-calibration of equipment
- Digital automation of production via CyberFab Manager (see p. 19 and EXTRA)

Monitoring

What are your machines up to? Conveniently access a dashboard via PC or smart device. In summary or for each individual machine, it displays:

- Current machine state
- Activity history and stats
- Temperature measurements, energy and media consumption
- Task lists with active CNC programs, including used tools, materials and time estimates
- Stock material details including material, dimensions and weight
- Planned and required service actions

Connectivity

Connect and integrate your machine with north-bound information systems through **CyberFab Connect**.

Data exchange standards: TSQL, REST, OPC UA and others

Provided data:

- Current state of machines and their individual components incl. peripherals
- Past activity records
- Intelligent maintenance data
- Information on consumption of stock material and consumables
- Information on planned production
- Interface for importing of production tasks
- Interface for updating of materials stock status

Connecting with third-party machines and equipment supported via **IndustryFusion** standards.

EXTRA: Schmelzer benefits from connected production cell

The company Ambros Schmelzer is „mastering metal": their latest addition targets an advanced level of large-format plate cutting automation.

One cutting machine, two autonomous, connected loading and unloading zones and two sorting workplaces: the setup in the factory of Schmelzer's Czech subsidiary is well thought out, aiming at maximum efficiency and flexibility. A 6 x 2 m MicroStep MSF Pro Carbon machine equipped with a 6 kW beam-shaping fiber laser is well suited for matching the varying production requirements. The system consists of three zones with three shuttle pallets and two loading/unloading positions that are served by MicroStep's special double loader MSLoad Twin. This allows to run two individual cutting projects or two cutting batch lists at a time – while the first position is intended for batches of standard 3 mm mild steel plates, the second one is for any other cutting tasks and materials.

The core here lays in digital automation – the whole production cell is automated with MicroStep's CyberFab Manager (see also p. 19) that ensures automatic generation and distribution of cutting programs based on production orders, stock management and production tracking. The operators follow instructions displayed on loader terminals e.g. about materials to be loaded. The system also decides autonomously where to unload cut parts and provides all information to the sorting interfaces. Part of the project are also two independent manual sorting workplaces equipped with visual sorting assistance by Workstation Manager, including all information about orders and executed programs stacked on any pallet. The system provides interface to Schmelzer's Microsoft Dynamics ERP via TSQL to automate data-flow and production tracking.

Member of...

IndustryFusion FOUNDATION

INDUSTRY BUSINESS NETWORK 4.0

Efficiency boost through automation

MicroStep's automated manufacturing cells lay groundwork for connected factories

1

An Australian shipyard relies on MicroStep's MSLoop solution for metal plate processing. MSLoop is an automated cutting table exchange system consisting of several cutting grates that significantly increases throughput of a CNC cutting machine as it allows simultaneous loading, cutting and unloading of material.

The operating principle is three cutting grates exchanging in an endless loop: a grate is first loaded, then moves into the work area for processing and after that into the unloading area. When fully unloaded, the empty grate moves underneath the processing area back for loading, while the other grates also switch places.

In this particular case, a pre-processing gantry has been added to the loading zone for marking and removing of surface primer in preparation for marking of synchronization lines.

Origins of MicroStep in the fields of control and automation have been organically present in its activities and helped shape the product portfolio already since the early days, when the company was designing its first CNC system. The idea of minimizing and automating material manipulation via multifunctionality and integration of handling equipment into the cutting machines was understood as a logical step towards cost reduction and saving of production time. In line with these requirements, MicroStep developed and implemented a number of automation solutions and machine-to-machine interfaces, integrating several cutting machines and automated material handling units into larger production systems, especially in large-scale production. The universal and modular nature of MicroStep's products lays groundwork for future industrial interoperability.

While facing ever-growing demands for greater efficiency, faster manufacturing, further cost reduction and resource conservation, the industry has recently witnessed a paradigm shift concerning future development of industrial engineering. Terms like digitalization, digital transformation, IIoT-powered automation and Industry 4.0 fueled discussion and activity in both academic and commercial spheres. Key improvements are expected to come as a result of smart project management, production automation, interoperability of production means, as well as implementation of predictive maintenance. MicroStep has been building its systems with these basic ideas in mind for at least a decade now.

Our philosophy is to deliver machines that are not isolated tools but form an innate part of production workflow by exchanging information, predicting potential breakdowns and automating the material flow throughout customer's production. The key areas include automation of processes in line with the ideas of IIoT and Industry 4.0, improving consistency of cutting quality, reducing the impact of human errors and increasing machine productivity.

Our customers who operate highly-advanced manufacturing facilities often look for complex automated cutting solutions where the input is the raw material plus task entries from their ERP systems and the output is processed and sorted high-quality parts, with an update on their status sent back to ERP; all of this regardless of the used cutting technology. Efficiency and reliability of the process are considered a matter of course.

To be able to realize diverse production projects efficiently, it is advisable for a manufacturer to have a set of versatile means of production that enable smooth transition between different projects. The trend shaping most industries nowadays is flexibility: a result of increasing demand for a wide range of more customized product variants. "Lot size 1" – the possibility of customization up to a production output of a single product for a single customer based on their requirements – is the ultimate goal.

Additionally, a high degree of automation, a good selection of technologies and the capability to process various sizes of workpieces are required. In line with the abovementioned trends, MicroStep's cutting machines are designed to be actively integrated into centrally managed production systems. This is achieved by automating the material flow using in-house produced feeding and lifting equipment and conveyors, combined with software that enables the machines to communicate with different applications of a production management system, such as stock-, order- and part databases as well as with external ERP systems. The goal is for the machine to be able to quickly adapt to different cutting and processing requirements, increase work efficiency, optimize the production process and minimize costs and risks. The whole production should be fast, smooth and transparent, monitored from the corporate network.

With its strong research and development capabilities, MicroStep is able to meet even those customers' requirements that were previously considered unfeasible by incumbent companies. The most innovative solutions to date result from close cooperation between customers who have visionary concepts of their production facilities and MicroStep that is ready to take up the challenges and turn their visions into reality. →

Alexander Varga, PhD
Head of R&D
MicroStep

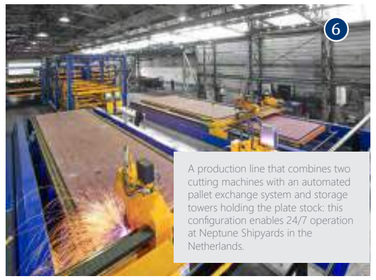
"Nowadays it is not only about the cutting but about complex part preparation. By adding equipment for loading, unloading and sorting, our machines become automated manufacturing cells."

BRÜGGEN Oberflächen- und Systemlieferant GmbH, a German supplier of containers and trailers, relies on a fully automatic shuttle table for loading and unloading its plasma cutting machine with a work area of 3,000 x 3,000 mm.

2

Ideally equipped for particularly large plates: two shuttle tables, each 12,000 mm long and 3,000 mm wide, do their job in Acciai di Qualità S.p.A. in Italy. Apart from other technologies, the 6 kW laser cutting machine is equipped with a bevel head for weld preparation up to 45°.

3



A production line that combines two cutting machines with an automated pallet exchange system and storage towers holding the plate stock: this configuration enables 24/7 operation at Neptune Shipyards in the Netherlands.

6

The Belgian leader in hydraulic tail lifts for trucks has invested in MicroStep's DS machine – a highly efficient, automated processing line that is capable of drilling holes, bevel cutting with plasma as well as plasma marking of plates up to a size of 6,000 mm x 2,000 mm. DS enables also automatic unloading of finished parts.

8

Eight cutting machines automatically loaded by a DEMAG industrial crane. Read more about this highly efficient solution for a Chinese company where MicroStep's software plays a central role – see p. 18.

10

Let´s talk real projects: MicroStep offers modular solutions for part processing (cutting, drilling, marking) and material handling that can be tailored to actual spatial conditions on customer's premises and integrated into their production workflow. Each cutting machine can be supplemented by various accessories and equipment for material loading, automatic unloading of large or smaller parts and precise part sorting. Available options include shuttle tables 2 3, loop table systems, fork loaders, chain and belt conveyors, cutting tables with built-in rollers, and loading manipulators 4 with vacuum or magnetic lifting.

MicroStep is distinguished by its ability to create smooth hardware and software interfaces

All of these solutions are developed and produced in-house in close cooperation between MicroStep's engineers and those of the customer in order to achieve the best optimization of equipment functions, control software and production flow. Another highly appreciated option is the possibility to integrate MicroStep machines with third-party handling and storage solutions such as automatic cranes, sorting manipulators and storage towers. This is possible thanks to the very nature of MicroStep's product philosophy – the design of machines, control systems and CAM software is all done in-house, by our own specialist teams who design the systems with their modular nature, interoperability and integration requirements in mind.

An example of such a project is a combination of two cutting and marking machines with an automatic pallet exchange system and a set of storage towers 6, which is successfully running at MicroStep's Dutch customer Neptune Shipyards. The maritime service provider had a clear idea for their cutting operation: they envisioned a system that will significantly reduce manipulation time and allow for expansion with other cutting machines and storage towers in the future. The automatic material handling solution came from a third party while MicroStep was responsible for its hardware and software interfaces with cutting machines and for automation of the cutting and marking processes.

Modular solutions for future expansion

The operation principle is as follows: a selected cutting grate with pre-loaded plates is automatically loaded into one of the two cutting machines and after the cutting and marking is done, it is automatically loaded back into its defined position in one of the storage towers. The prerequisite for such highly automated material handling is the ability of the machine to automatically measure the location and rotation of the plate on the cutting grate by a plate edge detection sensor.

Integration of a CAPP software is also recommended as it allows to automatically load cutting plans for the currently loaded material and also automatically initiate the cutting process, if required. MicroStep supplies its own production management software MPM (Machine Production Management, for more info see p. 17). Thanks to the automation, technologies that do not require operator oversight (e.g. inkjet marking) can run completely without supervision – all the plates loaded in the storage towers can be marked automatically outside of the regular working hours (e.g. during the night). In case of a forced interruption of the process the machine will notify the operator by an e-mail or text message.

Complete automation from a single supplier

To achieve the best utilization and smooth long-term operation of equipment it is preferable to have a single supplier. Therefore, MicroStep offers the whole package, including the automatic loading and unloading system MSLoad and storage solution MSTower 12 for both laser and plasma. For both systems there are several options that allow a certain degree of customization. One good example is a fiber laser solution delivered to one of the leading suppliers of industrial boilers and heating systems.

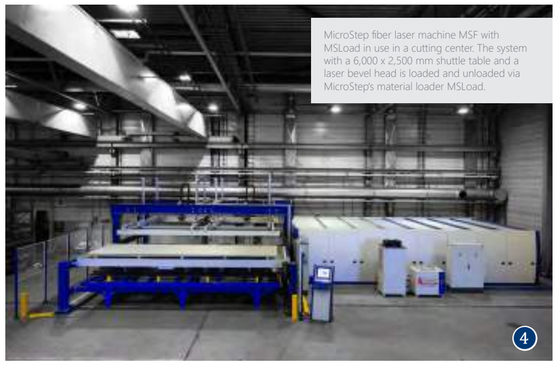
For their Hungarian plant, MicroStep supplied an automated manufacturing cell: a fiber laser cutting machine MSF with a working area of 3,000 x 1,500 mm and equipped with a shuttle table, an automatic loading system MSLoad and an additional custom-designed chain conveyor that brings a plate stack on a pallet from the warehouse to the loading position of MSLoad 13. The conveyor can carry three of these pallets at a time, each with a maximum weight of 3 tons. The pallets may contain plates of varying width. The width and order of the plates is entered into the system by the operator and since the machine is equipped with a width sensor it is able to confirm this information and

A great example of a laser system working largely autonomously in a multi-shift operation can be seen in the MicroStep Development Center in Bratislava, where a multifunctional laser cutting machine of the MSF series is integrated with a MSLoad handling system and MSTower storage system.

12

A solution used by one of the leading suppliers of industrial heating and cooling systems: a combination of the fully automatic loading system MSLoad with an additional conveyor, working together with a MSF laser cutting machine.

13



MicroStep fiber laser machine MSF with MSLoad in use in a cutting center. The system with a 6,000 x 2,500 mm shuttle table and a laser bevel head is loaded and unloaded via MicroStep's material loader MSLoad.

4

Hongxun Elevator Machinery in China invested in an automatic ProfileCut plasma cutting machine for beam processing up to 12,000 mm in length, including automatic material loading and unloading.

5

automatically choose the correct cutting plan. After using up the entire plate stack on one pallet, the control system alerts the operator who gives the order to move another pallet into the loading position. Afterwards the machine continues to run in automatic mode. The operator can meanwhile add another pallet on the conveyor and load new plates.

Eight cutting machines, one crane, one loading wagon, two output conveyors – all fully automated

A premium example of a large-scale, fully automated manufacturing cell managed by MPM software is the plasma cutting and marking line delivered to the top Chinese mining equipment manufacturer ZMJ: eight CNC cutting machines, an automatic crane, a loading wagon and two output conveyors 10, that work in a fully automatic mode and are capable of processing 500 tons of steel per day. More information about this project are on p. 16.

Material flow automation for structural steel applications is also in high demand. Apart from increased efficiency, systems for automatic loading and feeding of pipes, profiles and beams ensure high accuracy and reliability of the cutting results. While cutting of pipes and hollow sections 11 is considered a standard technology, automated cutting of beams poses a challenge in terms of accuracy as well as efficient fume extraction. MicroStep developed a solution involving 3D scanning of the true beam shape and a working area encapsulated in a protective cabin 5 with central suction.

A significant portion of structural steel applications is automated production of flanges, gussets and endplates on plate processing lines. For this purpose, MicroStep's plate processor DS 8 offers a unique combination of drilling, marking and high-precision bevel cutting. The newly redesigned DS machine provides plate loading by an automated manipulator and precise positioning on a roller track by three grippers with hydraulic jaws. The advantages are obvious: the drilling area is slat-free for the maximum safety of drilling operation, cut parts are unloaded automatically on an output conveyor that reduces unloading times significantly and the loading manipulator allows to place a stack of plates on the input which increases loading efficiency.

Integration of robotic manipulators with cutting systems significantly increases efficiency

The large-scale fiber laser machine MSF Max with a retractable mobile cabin 7 is a highly flexible and complex cutting solution. Thanks to the telescopic form of the cabin, the customer is free to choose from three different work area sizes (6 m x 3 m, 9 m x 3 m or 12 m x 3 m) while cutting and loading or unloading operations run simultaneously. And even more intriguing: integration of robot manipulators into CNC cutting machines significantly boosts efficiency of material handling especially when there is need to process less regular 3D objects such as ceramic tanks 14.

Finally, there comes shipyard automation: requirements for delivery of large-scale parts for decks and bulkheads involves production of parts and structures 10+ meters large. Through a partnership with welding automation provider Pemamek Oy, MicroStep became a global supplier of large-span gantries for cutting and other technologies within Pemamek's automatic panel production lines 9.

The priority topic for MicroStep still persists: how to increase the efficiency of customer's production? The answer lies in reduction of technological steps necessary for production of a single part, reduction of handling operations for a single part and in reduction of material handling times by automation of the material flow in the highest extent possible. The latest milestone on the journey towards this goal is our automated table exchange system called MSLoop 1.

MSLoad & MSTower
Video presentation:

www.microstep.eu/video

This MSF Max at the Italian steel processing center Acciai di Qualità S.p.A. has a retractable mobile cabin that allows to extend or shrink its work area to 6,000, 9,000 or 12,000 mm length so that it fits the actual need of the job shop in a most efficient way. It allows laser bevel cutting as well as parallel straight cutting with 2 heads. Overall effective size of the cutting table is 18,000 mm x 3,000 mm.

7

Together with its Finnish partner Pemamek Oy, MicroStep supplies cutting technology for fully automated panel production lines used in shipbuilding. For more information see p. 20.

9

Ikarus, the Hungarian manufacturer of buses and trolleybuses, opted for a combined fiber laser solution from MicroStep. Their MSF machine has both a shuttle table system for plate processing and an automatic feeder for cutting pipes and rectangular profiles.

11

This MicroStep's waterjet cutting machine is loaded and unloaded by a robot. The Romanian company SC Mondial SA, a subsidiary of the traditional Villeroy & Boch AG, a world-renowned sanitary technology manufacturer, has a solution tailored to their needs by MicroStep.

14

Automation systems | A selection of our automation solutions

Plasma
Laser
Plates

Shuttle table

Certain laser and plasma cutting machines from MicroStep can be equipped with a high-speed shuttle table system. While one of the tables is being unloaded and then reloaded again, the material on the other table is cut by the machine. This eliminates the costly downtime of the system that would otherwise occur during loading and unloading. MicroStep is offering shuttle tables for sheets with a length of up to 15 meters.

Plasma
Laser
Plates

MSLoad

MSLoad is a modular system for automatic loading of workpieces and unloading of cut parts for MicroStep laser and plasma cutting machines that brings production automation up another level. Combined with optional storage and part sorting systems, material handling solutions can be simple or complex as desired. The variable and modular design of the entire material handling system makes it possible to tailor the technology to fit all kinds of requirements and environmental variables. Loading and unloading can be done on one side or distributed to both sides of the shuttle table.

Plasma
Laser
Plates

MSLoad + MSTower

MSTower is a storage system for sheet material as well as for cut parts. It is a modular extension of the automatic loading and unloading system MSLoad. In combination with a tower storage, the cutting system allows for an almost complete automation even in a multi-shift operation. Standard MSTower is available in sizes from 3 x 1.5 m up to 6 x 2 m and offers various configurations of loading and unloading cassettes up to an overall height of 10 m. Other sizes as well as integration with supplementary or existing technology may be also possible upon request.

Plasma
Laser
Plates

MSLoad + MSTower + MSSort

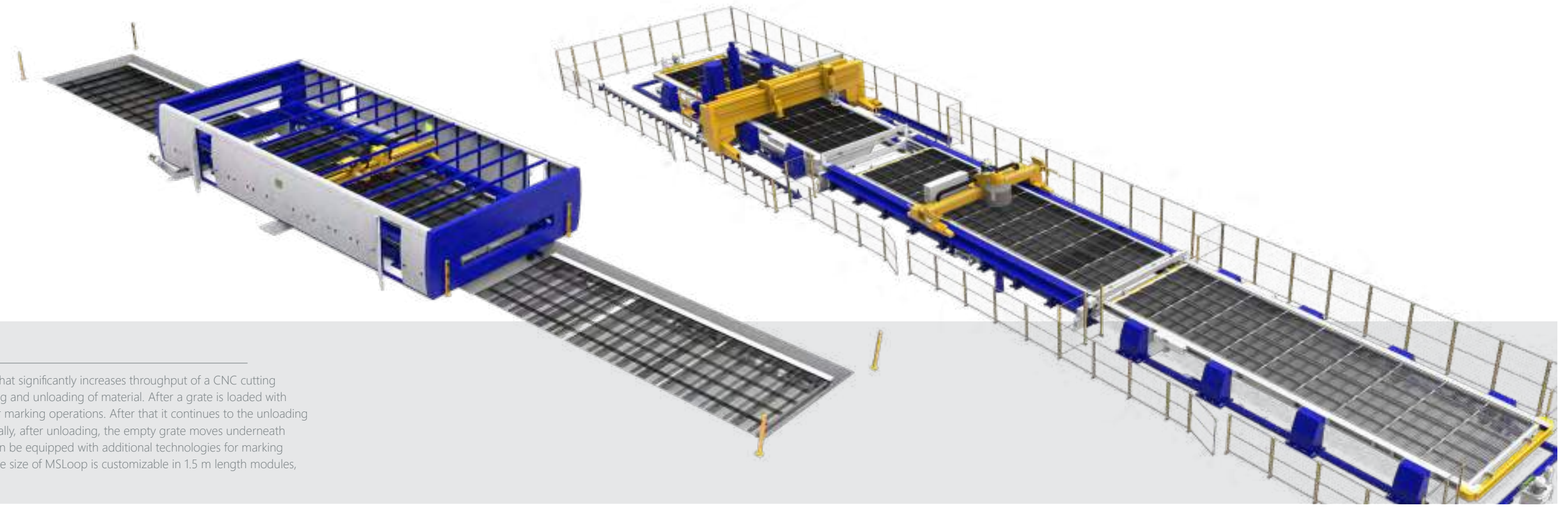
The combination of MSLoad with the parts sorting system MSSort and optionally also MSTower offers the user a simple and comprehensive material handling solution. MSSort provides separation of cut parts from waste material and their sorting according to a customer-defined sorting plan. MSSort's rotary sorting support features automatic exchange of clamping extensions, each designed to handle different shapes and sizes of cut parts. The proprietary CAM software package allows for a convenient creation of sorting plans based on corresponding cutting plans, part handling properties and sorting criteria of the particular workplace.

Plasma
Autogen
Plates

DS series | The automated plate processing line

The automated plate processing line DS from MicroStep was designed for high-efficiency drilling and cutting with the possibilities of automatic plate feeding and automatic part sorting on output. The machine is dedicated to heavy-duty structural steel applications such as production of high-precision fittings, gussets and end plates. DS series was designed for a high level of automation within the factory workflow and as a time and cost-effective production solution for certain types of flanged parts.

Laser
Plasma
Plates



MSLoop

MSLoop is an automated table exchange system that significantly increases throughput of a CNC cutting machine as it enables simultaneous loading, cutting and unloading of material. After a grate is loaded with material, it moves into the work area for cutting or marking operations. After that it continues to the unloading area, while the other grates also switch places. Finally, after unloading, the empty grate moves underneath the work zone back into the loading area – this can be equipped with additional technologies for marking or removal of primer from plate surfaces. The grate size of MSLoop is customizable in 1.5 m length modules, starting at 3 m.

Plasma
Pipes & profile

Automation for pipes, profiles and beams

Even if you process just pipes, hollow sections or open profiles, MicroStep got you covered: the machine series PipeCut, CPCut and ProfileCut are dedicated to a wide range of structural steel materials. For larger production batches it is reasonable to introduce automation to your production. MicroStep's solutions include automatic loading, feeding and unloading of pipes and profiles as well as integration with existing or supplementary equipment for marking and cleaning.

Plasma
Pipes & profile

Material handling for particularly large pipes

Pipe and profile cutting machines from the PipeCut series can be enhanced by a material handling system that allows automation of pipes with diameters between Ø 30 mm – Ø 300 mm. For larger pipes, a special version is available that enables handling of round tubes of up to Ø 700 mm and rectangular profiles with sizes from 100 mm x 100 mm to 500 mm x 500 mm. The system can process workpieces with lengths between 3 m – 12 m weighing up to 3 t. The finished pieces are collected in an output container.

Plasma
Beams
Pipes & profile

Automated handling of H, U and L beams

MicroStep's beam cutting series ProfileCut can be delivered as an automated beam processing line dedicated to H, U and L beams of different sizes and lengths. In such a setup, a conveyor belt brings the beam within the reach of a gripper which positions it precisely in the working zone located inside the machine's safety cabin. Inside the working zone, the correct position of beam is verified by a laser scanner and the cutting process is started. The finished beam then moves to an unloading roller conveyor while smaller parts can be off-loaded to the side into containers.

Laser
Pipes & profile
Plates

Combined solution: Automated sheet, pipe and profile handling

Machines from MicroStep's fiber laser product series MSF offer a handful of material handling solutions. Apart from sheet metal automation via shuttle tables and its further expansion with MSLoad, MSTower or MSSort equipment, there is also a possibility of automating the loading of pipes and profiles on the same machine, and unloading of cut parts from pipes through a conveyor system. Additional solutions such as the automatic nozzle changer further increase the degree of automation.

Entering the 21st century at the speed of light

Swarco Dambach GmbH, a specialist in road signs and traffic signals, strengthens its machine pool with a fiber laser machine and an automatic material handling system from MicroStep

At construction sites, on the highway, at a town entrance: traffic and road signs from Swarco Dambach GmbH regulate the traffic in many places. Swarco's production site in Gaggenau on the western edge of Germany's infamous Black Forest was using the same machines for many years. With an investment into a modern fiber laser cutting system with material handling from MicroStep, Swarco achieved an enormous leap towards greater efficiency and flexibility. It is an important step for maintaining their leading position in the otherwise closely contested market.

Everyone knows Swarco's products. Whether you travel on foot, by car, by bus or by train: products that the company manufactures in their Gaggenau site, and also within the entire Austrian Swarco Group, guide our ways and give us direction in our everyday lives. This is because Swarco develops and produces solutions for securing, guiding and regulating road traffic, such as road markings, signs and traffic signals. "Swarco is a company that makes products of the highest quality standards, is always deeply involved with the customer, knows what the market needs and has the ability to react very quickly to changes. Our customers are spread all over the world and, at the end of the day, every road user is our customer," says Andreas Flamm, strategic purchaser at Swarco.

Swarco offers a wide product range and is also developing new types of digital and automated components for better and faster traffic management. The market for standardized signage is highly contested – around 15 manufacturers compete with each other in Germany alone. The materials are prescribed, as are the foil coatings and RAL colors. Only a few factors decide who succeeds with the federal, municipal or local authorities: "The minimum quality benchmark is clearly defined so delivery times and the cost factor play a key role. Efficiency and flexibility in production are therefore correspondingly important," emphasizes Bernard Frank, plant manager at Swarco Dambach in Gaggenau.

MSF Pro laser replaces ten machines thanks to precision and automation

To achieve higher speed and efficiency in the production processes, the long-established company recently began to modernize its aging technology pool. The most important new addition is MicroStep's fiber laser cutting machine MSF Pro equipped with an automatic sheet handling system MSLoad. The new solution replaces in fact ten production machines, including nibblers, laser cutters and milling machines. "We are now more flexible, faster, more efficient, produce more cost-effectively and with higher quality. We have arrived in the 21st century at the speed of light," says Andreas Flamm. The 2D laser cutting system was installed in the spring of 2021 and has a working area of 4,000 x 2,500 mm. Its main task is processing of thin aluminum sheets 2 to 3 mm thick, with the occasional slightly thicker plate or a piece of steel as required by the standards on world's roads. The additional rework of earlier days has been completely eliminated.

A lot of planning and preparation to implement the key technology

In their search for the right solution, Andreas Flamm and Bernard Frank took their time. After all, they had to define and procure a groundbreaking key technology for the company. From the very beginning, it was clear it had to be a 2D laser cutting machine able to process standard 4 x 2 m metal sheets. There was the additional challenge that material absolutely could not be scratched during the entire process. After some market evaluation, the idea of a requirement for automatic loading was born, joined by unloading in the later planning stages. "Not all manufacturers have this technology automated. Some might offer it, but then would have to develop it. MicroStep had the system ready and it works. That's why I'm satisfied. The solution of picking up the sheets without leaving scratches also works," says Bernard Frank.

Yet the decision-making process was a long journey that also placed high demands on the manufacturer. "We are definitely a demanding customer. We sent an incredible number of samples around, had them cut by laser and tested them. We played with different laser powers and different sheet thicknesses. Because this was a huge investment for us and it had to work exactly the way we needed it to. MicroStep spared no effort," Andreas Flamm looks back.

Job cutting ability a welcomed bonus

It took intensive planning and many extra meetings for the two responsible people. In the end, they found a solution that covered all requirements. Flamm estimates the return on investment at around two years. There are even capacities for additional job cutting available now. "If all projects went like this, we would all be happy," says the strategic purchaser.

Swarco
Video presentation:

www.microstep.eu/video

Andreas Flamm
Strategic Purchase
Swarco Dambach GmbH

„We are now more flexible, faster, more efficient, produce more cost-effectively and with higher quality. If all projects went like this, we would all be happy."

Automatic loader boosts production efficiency

More self-sufficiency for Hykemont: The Slovak producer of steel structures invests into an automatic laser cutting cell

Located in the southern Slovak town of Nové Zámky, Hykemont spol. s r. o. has been producing steel construction elements for more than 25 years now. Almost the entire history of the company has been tied to the Austrian steel shipping and storage container producer CONTAINEX by an exclusive deal. This mutually beneficial relationship has brought stability to Hykemont and ensured continuous growth.

Originally, Hykemont's production was focused solely on steel warehouse containers and only later it was extended to component production.

The decision to invest in a brand new cutting and material handling equipment has been a part of the company's long-term growth plan. Hykemont wanted to innovate the production process and be less dependent on third-party suppliers. Since the company's production is highly specialized, requiring large numbers of the same parts with minimal variability, an automated solution was preferred. Therefore, Hykemont was looking for a system able to cut 6 mm mild steel plates in two shifts per day and to automatically load the raw material and unload cut parts.

After careful deliberation, Hykemont opted to buy MicroStep's fiber laser machine MSF Pro with a work area of 3,000 x 1,500 mm, equipped with a 4kW IPG laser source capable of cutting mild steel up to 20 mm thick. Productivity of this machine is further augmented by MicroStep's automated plate loading system MSLoad – a stack of plates just needs to be placed on a designated position and the rest of the process is fully automated. Vacuum pads pick up a plate and a tactile sensor measures its thickness. Based on this information, a corresponding cutting program is selected by MicroStep's Machine Production Management (MPM) software. The previously cut parts are meanwhile being unloaded from the cutting table onto a pallet using a fork unloading unit. The vacuum loader deposits the plate onto the cutting table and the cutting may begin. The pallet with the cut parts is moved to the unloading position of MSLoad where it is processed.

"The new solution enables us to meet markets' high demands in both the quantity of ordered parts and their quality, which is vital since the cut parts are further being processed at a robotic welding station," says Kristína Koláriková Kulichová, CEO of Hykemont spol. s r. o. "Apart from these major advantages, there are also others like lower costs for a unit of production, higher utilization of resources, increased safety of our workers and a lower amount of manual labor."

The production manager Pavol Stromček also acknowledges the production boost: "Using this machine, two shifts are now able to process 4 to 5 tons of mild steel per day. The solution greatly saves the time that would be otherwise needed for manipulation with material."

Since Hykemont has opted for nitrogen laser cutting, they faced a new logistical problem. Even though nitrogen cutting is better for thin plates, it also consumes much more gas than oxygen cutting. The standard solution would require building a nitrogen tank and carrying out frequent gas deliveries in order to maintain the nitrogen supply necessary for production. But Hykemont preferred a more efficient option: the company purchased a nitrogen generator. Though the cost is substantial, it makes Hykemont self-sufficient in this regard and the investment should return within 5 years.

There is another aspect of the purchase as the CEO points out: "From the environmental point of view, this solution has significantly reduced the number of trucks that were previously delivering pre-cut parts from our suppliers."

Hykemont
Video presentation:

www.microstep.eu/video

Krístína Koláriková Kulichová
Managing Director
Hykemont spol. s r. o.

"The new solution enables us to meet markets' high demands in both the quantity of ordered parts and their quality, which is vital since the cut parts are further being processed at a robotic welding station."

"All expectations fulfilled!"

stürmsfs AG, one of the most modern steel and metal processing job shops in Europe, invested in a complex MG machine

stürmsfs AG is considered one of the leading job shops in Switzerland and one of the most modern across Europe. This steel and metal business is well prepared to take care of all jobs, both complex and simple. For this reason, the company has invested heavily into digital systems, automation, and cutting edge technology in recent years. Since July 2017, this includes also the MG plasma cutting machine from MicroStep. stürmsfs relies on this multifunctional cutter for 3D processing of sheet metal with a plasma rotator, 2D plasma torch and drilling spindle.

Small locksmiths, steel construction builders, large manufacturing plants, all depend on the stürmsfs AG's high-quality products and their on-time delivery ensured by their own truck fleet. "It is the diversity that makes our company so important that we are considered the most established steel and metal dealer in Switzerland. We are competent in many areas like machining and thermal cutting. We are also known for a high degree of automation. We function as a detached workbench of the customer." Marcel Meier, Head of Procurement & Corporate Development, explains. Automation of the whole production cycle – from placing of the order and manufacturing to delivery – is one of the company's many strengths.

Wanted: Technologically advanced plasma cutting system with bevel cutting and drilling

As a part of a large-scale production optimization project, the company decided to build a new hall for thermal cutting. Their now five-year-old plasma cutting machine was to be supplemented with a second one in order not to affect the current plasma cutting orders. After an extensive analysis of the market as well as the technical possibilities and considering their particular needs, stürmsfs finally decided in favor of a plasma cutting machine MG from MicroStep. "We were convinced by the whole package. From the start we had an impression that the bevel head we are getting is state-of-the-art," says Marcel Meier looking back at the purchase decision at the end of 2016. In addition, performance of the drilling unit has also proven to be most convincing. "This is where MicroStep is far ahead compared to other CNC machine producers."

Since July 2017 the machine has been in use for two shifts per day and when it is necessary, a third, night shift is added. The job shop has bought a plasma cutting system enabling both 2D and 3D plasma cutting, drilling, tapping and countersinking.

"The machine is two to three times more productive than its predecessor."

The working area of 21 x 3.5 m, divided into two cutting zones, allows processing of large-format plates in parallel – while in one zone the material is being cut, the other one is safe for unloading of cut parts and loading of new material. The job shop is usually cutting plates between 5 and 35 mm thick. Both the drilling spindle and the plasma rotator with infinite rotation are being used quite often. The decision has proven to be the right one also for the plate production manager Markus Egger: "We are very satisfied with the machine. Especially when it comes to drilling, it is two to three times more productive than its predecessor. We have a great advantage, we are able to cut threads, we are able to countersink. Both accuracy and quality of bevels are very high."

The switch to MicroStep was accompanied by the change to the SigmaNEST CAD/CAM software made by an American nesting specialist. Marcel Meier is satisfied: "We have taken some risks because we had to change both the machine and the nesting software provider at the same time. And the whole change with MicroStep worked out very well," says the head of Projects and Corporate Development who played a major role in the investment decisions. This project has left behind many happy faces among the responsible people from stürmsfs AG. "The system is very productive and reliable – it has met all our expectations," says Marcel Meier. "Our operators appreciate that they can actively influence the cutting result."

Markus Egger
Head of Sheet Metal Division
stürmsfs AG

stürmsfs

"We are very satisfied with the machine! The accuracy and also the bevels are of a very high quality."

stürmsfs
Video presentation:

www.microstep.eu/video

Operation 24/7: The automated cutting line (left) at ZMJ is controlled from a central control room (above). A total of eight CNC plasma cutting machines from MicroStep are automatically loaded and unloaded by a Demag process crane.

Forty percent production increase

MicroStep and Terex have supplied an automated production line for the Chinese mining equipment manufacturer ZMJ

MicroStep and Terex MHPS GmbH (manufacturer of Demag industrial cranes) in a pioneering tandem: in close cooperation, the companies developed a material handling system for automated sheet metal processing for China's leading coal mining equipment manufacturer Zhengzhou Coal Mining Machinery Group. In total, eight MicroStep plasma cutting machines are being fed with plates by an automated Demag process crane from Terex. As a result, immense efficiency gains are achieved in the production process.

The Chinese mining industry is booming and so is the mining equipment sector. The Zhengzhou Coal Mining Machinery Group is one of the market leaders both for stationary equipment for roof and long-wall supports as well as for mobile machinery that operates in mines. At its plant in Zhengzhou, the capital of Henan province, the company is running a production line for automated plate processing consisting of several double-gantry MicroStep cutting machines and a Demag process crane, which is responsible for storage and retrieval of the plates as well as the feeding of the cutting systems in a 24/7 operation. At the heart of the system is the production management software CyberFab Manager from MicroStep, which controls the entire production process.

The investment has paid off for ZMJ: Every day, the cutting line is able to process up to 155 metal plates in three-shift operation, with one production cycle now taking only one to two hours, compared with the four to eight hours previously. The intralogistics system implemented for this solution also ensures that the machinery is utilized to a consistently high level. The impressive result of this pilot installation: production in the entire plant has been increased by 40% with a monthly machine output of 12,000 t.

General trend towards automation

This project reflects the current trends in the field of industrial mass production. Increasingly, solutions with central production management and a high degree of automation are in demand. The goals are: the highest possible efficiency, optimization of the production process and, of course, reduction of risks and costs. The whole production should be fast, smooth and transparent. In addition to material flow and material processing, the system should also be interconnected with the central warehouse, order management system and the customer's ERP system.

The automatic line installed at ZMJ consists of eight CombiCut gantries with cutting areas of 28 x 3 m, each equipped with two high-definition plasma sources and an inkjet marker. In addition, there is an automated overhead crane (9 t x 16.5 m), an input wagon with a load capacity of 15 t and two output conveyors for collecting the cut parts and removal of waste material. The entire line is fully automated via MicroStep's CyberFab Manager software, with integrated software modules from Demag for crane management and material handling. The crane is moving on a 120 m long track in the height of almost 13 m. In the beginning of the process, the crane transports one of the plates (up to 12 m long and 40 mm thick) by means of strong magnet spreaders onto a free machine or into one of two buffer zones assigned to each of the eight CombiCut machines. After the cutting process, the crane moves the cut plate onto an output conveyor belt. Here, the plates leave the automated area and proceed to be sorted out manually.

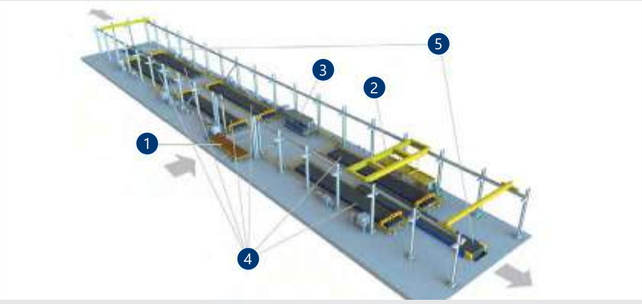
An area measuring 120 x 18 m was fenced off within the production facility for the storage and processing of plates. Here, the customer not only benefits from a better organized flow of material, but also from improved safety at the workplace: a dedicated access concept prevents any personnel from entering the individual processing areas when they are automatically approached by the crane. When routine maintenance work is performed on one of the cutting systems, the automatic crane by-passes the danger zone in order to protect the personnel.

ZMJ
Video presentation:

www.microstep.eu/video

EXTRA: Management of the entire production process via MicroStep's CyberFab Manager

The entire manufacturing process is controlled by MicroStep's production management software CyberFab Manager, with integrated control software of the crane (WMS) and conveyors. Through CyberFab Manager, every production step is coordinated and run automatically. Therefore, no active intervention from the operating personnel is required. The parts to be cut are automatically nested by MicroStep's proprietary CAM software Asper® (nesting = material-saving distribution of parts on the plate by nesting algorithms in order to utilize the material to the maximum via minimizing waste), and after nesting, the corresponding cutting plan is generated for a particular plate from the stock. Generated cutting plans are then distributed to the individual CNC plasma cutting machines through CyberFab's Machine Manager app. The crane automatically supplies available cutting machines with plates, based on information received from the material loader and control systems of the particular machines. The position and orientation of the plates on the cutting tables is measured automatically by a laser sensor. Also, the cutting process is carried out fully automatically. After cutting, the cut parts and residual waste are moved by the magnetic crane to either of the two output conveyors. In this case, machine operators are serving only as supervisors and service technicians, for example to replace worn consumables.



1 Material input (wagon) 2 Automatic crane 3 Control room
4 CNC cutting machines 5 Output conveyors

EXTRA: CyberFab Manager automates the production process on MicroStep machines

CyberFab Manager suite provides computer-aided process planning (CAPP) features that automate the workflow of CNC machine(s) or production lines. It is an integrated system of order processing, cutting plan creation, stock management, machine operation planning and evaluation which interconnects pre-production data, control systems of CNC machines and MicroStep's CAM software Asper® and mCAM. It helps to reduce work-in-progress, save material and eliminate operator errors.

A substantial part of MicroStep's product portfolio is focused is on high-end customers with large production facilities who put emphasis on efficiency and a high level of automation. CyberFab Manager provides an integration platform for their business by interconnecting stock materials and production orders with their production machines. It effectively automates the information flow between different departments through automatic assigning and distribution of manufacturing tasks.

The suite is primarily aimed at facilitating efficient machine use. When used to its full potential, the system offers the operator a cutting plan together with the location of the specific material (plate, pipe...) in the warehouse. Task of the operator is then to place the material on the cutting table, synchronize the coordinate system with the position of the semi-product (which can be automated by using a laser sensor to detect the material edge), install the required consumables and start cutting. All necessary parameters are selected automatically, based on the information contained within the cutting plan. When using an automatic loader, the system also loads the semi-product into the cutting area. After cutting it can also automatically unload or even sort the finished parts.

Although designed for MicroStep machinery, CyberFab Manager can be also used with third party machines. Naturally, the production data can be shared with ERP systems such as SAP or Microsoft Dynamics. For efficient production planning, the suite provides a variety of customizable reports and evaluations.

Primary application field for CyberFab Manager are businesses with multiple machines, e.g. steel service centers or large steel processors in various industries – shipyards and offshore, energy, agricultural, automotive and others. One of the main benefits lays in automated task allocation for multiple machines based on priorities and technology availability.

Core feature of the system is the ability to provide update of the databases after cutting: if specific parts have been cut incorrectly, the operator can identify them directly on the control screen. These parts are automatically returned to the order database and assigned the highest priority for the next nesting so that the order is completed as soon as possible. Actual status of each order and location of each part along with other information can be tracked in real time. Such update feature is unique to CyberFab Manager – it is possible only thanks to the native integration with MicroStep's control system and CAM software, all of which is developed in-house at MicroStep.

Integration with material loading and sorting systems

CyberFab Manager supports automated material handling via material loaders, automated storages and part sorters. In case of an automatic loader, the system compares generated cutting plans with the inventory of the warehouse and determines what is going to be cut. Based on the information received, it requests the needed types and amounts of material from the storage. A warehouse operator delivers the material stack to the input position of the loader and the rest of the process is fully automated: The loader loads the sheets into the machine. The machine can then subsequently verify each material by using a built-in thickness sensor or by scanning a barcode / QR code printed on the material. After completion of the cutting process, the control system sends information about what was cut to the production database and information about material usage to the stock database.

The system also natively supports fully automatic operation of equipment set-ups such a fiber laser machine with automatic loader, automated tower storage and a part sorter where the system manages the whole operation and the operators are responsible for loading the material into the tower, unloading pallets with sorted parts and monitoring the operation.

Along with MicroStep machines, CyberFab Manager based systems have been already deployed in dozens of businesses all over the world.

CyberFab®
POWERING MicroStep

KMT Waterjet ensures maximum production capacity and availability for your MicroStep cutting system

STREAMLINE PRO
world's fastest waterjet cutting with up to 6,200 bar
- increased productivity
- reduced abrasive consumption per part
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NEO
KMT Waterjets' latest 4,000 bar pump generation
- field proven high-pressure concept
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50 1971~2021

CNC cutting systems for large-scale applications

MicroStep partners with global welding automation expert Pemamek for advanced shipyard projects

As a manufacturer known for innovations and customer-driven R&D projects, MicroStep has a rich history of supplying the shipbuilding and offshore industries with emerging cutting-edge technologies. Over almost two decades the company has supplied numerous machines to well-established names in the industry such as STX, Damen, Vard/Fincantieri, Royal IHC, Lürssen, Meyer, Keppel and many more, a majority of which were combined plasma bevel cutting machines for automated welding preparation and sheet marking. Several shipyard enterprises became our global partners and enthusiastic cooperators in development of new solutions that make their production more reliable, safer and efficient in the long run. Among equipment and automation solutions developed for the demanding shipyard environment were: automatic plate alignment via laser sensor, management of working zones of cutting machine with an interface for an external automatic crane for automatic loading/unloading of material, barcode and QR code marking, Machine Production Management (MPM) software suite and also our well-known ACTG® system for auto-calibration of beveling tool stations.

But it wasn't until 2014 that MicroStep was able to participate in the shipbuilding's premium cutting application – automated panel lines. Thanks to the partnership with the globally operating Finnish welding and production automation provider Pemamek, whole new application horizons have opened up for MicroStep.

Cutting of large-scale welded panels

One of the prominent manufacturing application areas in shipbuilding is production of large-scale panels with welded stiffening structures that are used to build decks and bulkheads of a ship. In modern shipyards, these panels are produced by used fully automated and robotized high-tech flat panel lines consisting of several gantries that provide the technologies for welding of single sheets to make a panel and subsequent cutting and marking processes, positioning and welding of stiffening beams and finalizing of the panel structures. Panel lines can be integrated directly into the yard's design- and manufacturing-data systems. Modern panel lines produce high-quality prefabricated components and subassemblies that allow for high-speed welding, even utilization of hybrid laser welding processes.

MicroStep was chosen to deliver the cutting part of panel lines – a robust DRM-PL gantry with effective cutting widths as big as 24 m. Apart from the sheer machine size that implies high-end design and manufacturing coupled a powerful drive-motion system, the peculiarity in this case is in the technology: the thickness of the panel as well as its surface levels can vary as the single plates comprising the panel are of different thickness. Besides the usual cutting heads (plasma or oxyfuel rotators) which enable bevel cutting of V-, X-, Y- and K-cuts, DRM-PL machines are equipped with a blasting or grinding unit and a marking tool. Blasting head is used to clean the primer from certain areas on the workpiece where, subsequently, stiffening beams are welded.

The blasting head has an integrated plasma marker to mark synchronization lines for future positioning of the stiffeners. Finally, an inkjet marker is used to print descriptions and technological marks.

Advanced features for precise panel processing

Panel cutting machines need to have several special features. For example, the starting point of cutting has to be set in relation to the position of welds on the panel since the finished product has exactly defined weld positions. Therefore, the machines are equipped with a linear laser scanner to identify welds in any direction. Another feature is the simultaneous blasting/grinding and plasma marking with the plasma marking torch, which can rotate automatically around the blasting head to enable marking in different directions.

Plates of varying thicknesses, which make up the panels, and the welds between them require complex control of the plasma cutting process. Metal plates of different thicknesses require different cutting parameters such as cutting speed and current. The borders between different sheet thicknesses are linear with surface inclinations ranging from 1:4 to 1:3 so the parameter change is not sudden but linearly interpolated. The most complicated issue with these machines is cutting height control. The classic height control according to measured arc voltage is not enough in this case. If the border is on the top side of the panel, the cutting height is controlled in a robotic mode according to the defined shape of the weld. After a transition to a new thickness, new parameters first need to be measured by the control system and only then the height control according to arc voltage can be turned on again. Furthermore, when crossing welds, the height control needs to be deactivated so that the cut contour is not deformed.

MicroStep's panel cutting machines are capable of cutting large-scale parts with dimensions up to 24 x 24 m, inkjet marking, plasma marking as well as primer removal via sandblasting or grinding technologies.

Irving gears up with MicroStep

Shipyard invested in a 16 m wide gantry with bevel technology

Irving Shipbuilding Inc. (ISI) has built one of the most powerful combinations of shipbuilding, ship repair and fabrication expertise in Canada and the eastern seaboard of North America in more than fifty years. The company has built over 80 % of Canada's current fleet, and its Halifax Shipyard has been at the forefront of Canadian shipbuilding for more than 125 years. Today, the company also relies on technology from MicroStep.

ISI consists nowadays of five shipbuilding, repair and fabrication facilities – all committed to the company values of integrity, customer service and pride. Together, they make up Eastern Canada's most extensive array of docks, slipways, steel fabrication shops, outfit and machine shops and blasting and painting facilities.

In 2011, the historic National Shipbuilding Procurement Strategy (NSPS) was undertaken by the Canadian Government, seeking to identify two shipbuilding Centers of Excellence for the country for the next 30 years. Irving Shipbuilding was extremely proud to have been selected by the Canadian Government to build the Royal Canadian Navy's new combat fleet, a program that comprises 21 vessels and $25 billion over a period of 30 years.

Canada's chosen shipbuilder

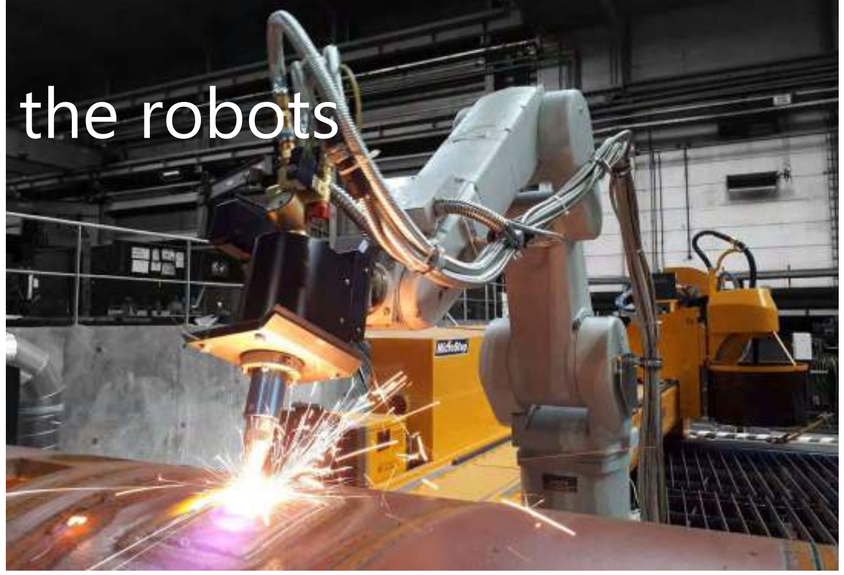
As Canada's chosen shipbuilder, Irving Shipbuilding Inc. is working with the Royal Canadian Navy on the next class of Canadian Surface Combatant (CSC) and Arctic and Offshore Patrol Ship (AOPS) vessels under the National Shipbuilding Strategy (NSS). The long-term promise of stability granted by the NSS led the shipbuilder to invest in its Halifax Shipyard to build North America's most modern and largest specialized shipbuilding facility.

As Canada's chosen shipbuilder, Irving Shipbuilding Inc. is working with the Royal Canadian Navy.

One part of this giant investment included the purchase of a cutting-edge panel line from the Finnish global welding and production automation provider Pemamek Oy. MicroStep has been a part of this project and supplied the plasma cutting part of the line: the 16-meter wide gantry is equipped with a plasma rotator for CNC bevel cutting up to 50° and with additional heads for sandblasting (primer removal), plasma marking and inkjet marking.

Here come the robots

A broad portfolio: From robotic workplaces to robots for cutting of 3D shapes



MicroStep's continuous activity in the area of robotic applications has resulted over the years in a comprehensive product line of components for robotic working cells – different types of workpiece positioners, gantry-type and cross-beam motion systems and standardized modular welding cells have been part of the portfolio for many years. Robots have been used for manipulation, welding, cutting or routing as part of a work sequence in production lines or as standalone cells.

Furthermore, apart from designing robotic and semi-robotic workplaces to automate various production processes, MicroStep's engineers have been increasingly intrigued by the vast movement possibilities of robotic arms and their potential to be utilized as carriers of cutting tools on gantry-based CNC cutting machines – especially in the field of structural steel applications such as cutting of beams or domes. This area is being gradually developed.

Integration of robots: Apart from mechanical challenges the main job is to be done by control system developers

Apart from mechanical challenges with integration of robotic arms into CNC cutting machines, the main job is to be done by control system developers. Robotic arm brings a whole different type of kinematics, a few more driven axes and requirements for controlling the cutting technology. Besides the robot itself, the machine can contain also other, standard, tool stations with various straight/bevel cutting, drilling or marking technologies. In order to achieve seamless switching between cutting heads, the control of the robot has to be integrated into the control system of the CNC machine responsible for all the mechanical modules of the system. Even though robotic arm manufacturers supply their products with genuine control systems, their implementation may present several obstacles, such as incompatibility of the communication interface, too low refresh rate of the desired effector position, insufficient feedback speed or issues of coordination with other movement axes of the machine. So here's the trick: to ensure desired operating properties, MicroStep has developed its own control modules for robots within the iMSNC control system, which cooperate flawlessly with the rest of the system. The solution takes into account mechanical tolerances of the individual robot joints as well as its movement specifics arising from the robot's construction.

Solutions with robots

MicroStep's projects with robots so far include turnkey applications such as welding of frames of tower cranes, ATVs and snowmobiles, welding of high voltage capacitors, transformer tanks and conveyor rollers as well as milling of plastics, luting, relocation of aluminium casting molds, a test cell for a partial simulation of a production line, automated cutting of ceramic tanks, cutting of coupons from hot-rolled steel and others.

Robotic pipe cutting

More flexibility for the Jan De Nul Group: An innovative combination of plasma plate cutting and oxyfuel cutting of pipes by a robot

A robotic arm on a gantry-type CNC plasma and oxyfuel cutting machine capable of cutting both flat plates and pipes with the same gantry? Even if it's not the first of its kind in the lands of Benelux and beyond, it is still an exceptional and highly innovative combination of high-quality cutting technology. For MicroStep, this newly developed solution has proven to be an eminent success.

There are companies that everybody has heard of, even the people who don't follow the Belgian industry sector. This is often due to an article in the newspaper or a report on the TV about a success story which illustrates the strength of Belgian companies abroad. You may remember the name Jan De Nul from the mega dredging project in Dubai or the new Suez Canal in Egypt. However, Jan De Nul Group is more than just a dredging company. They have four main areas of interest: dredging and marine works, offshore services, civil works and, finally, environmental works. The JDN Group has grown into a global player by continuous investment into these four activities. In 2015 the group took over the foundation expert Soetaert NV in order to strengthen its expertise in hydraulic engineering and foundation building.

Unburdening its customers: Everything from design up to execution is being taken care of

A success strategy is supported by many pillars but one of the most important ones is "unburdening the customer". In the past, work was based mainly on following the customer's specifications; today, customers are looking rather for a complete solution to their problem. The multidisciplinary teams of Jan De Nul Group follow the integrated approach – everything from design to execution is being taken care of with their own people and equipment. Some projects even include maintenance and financing. A customer always gets a creative and innovative solution tailored to their own specific needs. This endeavor is supported by a large design and engineering department which serves all four areas of interest.

Continuous investment into new technology and equipment

An equally important part of the strategy is continuous investment into new technology and equipment. Let's illustrate this by looking at JDN's own fleet. It consists of more than 85 ships, 47 of which were built between 2007 and 2013. Bigger isn't always necessarily better but for large-scale international projects that became JDN's specialty, it is an asset that cannot be underestimated. The group works with world's largest trailing suction dredgers, the sister ships Cristóbal Colón and Leiv Eiriksson with hopper capacity of 46 000 m3 and depth range up to 155 m, as well as the subsea rock installation vessels Simon Stevin and Joseph Plateau which are the most powerful vessels of their kind.

"We think that we can make complex parts best by ourselves."

More remarkably, Jan de Nul is one of the few dredger companies that design their vessels and equipment themselves. There are good reasons for this. "First of all you have better control over the delivery times and there is also the quality factor. We produce many complex parts of unusual shapes and that requires a great deal of know-how. We think we can make these complex parts best by ourselves. Furthermore, this knowledge you want to keep in your own house and not outsource," says Jose Pycke, Workshops Manager for Jan De Nul Group. 70 operators work in the production department. It is divided into a material preparation area, welding workshop and machining workshop equipped for processing of very large parts. The largest vertical lathe can handle parts with a diameter up to 5,5 meters.

The complete cutting solution from MicroStep

"Our old oxyfuel cutting machine was still functional, but we couldn't do weld seam preparation with it. We had to do the bevels manually with a hand torch or an angle grinder, and that took a lot of time. The machine from MicroStep solved this problem," says Mr. Pycke.

"Furthermore, materials thicker than 25 mm had to be cut with oxyfuel technology which was much slower."
MicroStep delivered the complete cutting solution: with a 12 x 3 m cutting area for plates up to 150 mm thick and a zone for cutting pipes with a robot situated along the outer side of the machine guidelines, the machine is capable of processing tubes up to Ø 2000 mm and wall thickness 80 mm. The challenge here was to ensure cutting and positioning of pipes in the entire required range of diameters (Ø 100 – 2000 mm) and thicknesses and, at the same time, to propose a technical solution that would allow the most convenient manipulation of pipes while requiring minimal construction interventions in the production hall. The final solution was an oxyfuel torch on a robotic arm, as this provides high movement flexibility and isn't limited by the height of the gantry. This way it was possible to place the pipe cutting tracks and supporting rollers on the floor level without the need to "sink it" underground. For compensation of possible deviations of the pipe shape, a laser scanner integrated in the torch holder is used to scan the surface of the pipe in the place of the cut will be. If any deviations are detected, the cutting program is automatically adjusted. The use of a scanner in combination with a sophisticated robot movement control (compensating for the existing inaccuracies of the robot's construction) and the dedicated 3D CAM software mCAM achieves accurate openings and contours of different shapes. The pipe cutting zone is equipped with a safety light barrier which turns on together with the robot to ensure operational safety.
"First of all, the plasma/oxyfuel cutting machine with the integrated robot has resulted in considerable time savings because all the weld preparation is now done automatically and in one step, which also increases quality. As to the pipe cutting, not only has our reach been increased, but we can also cut any shape. In terms of flexibility, we have improved significantly," José Pycke concludes.

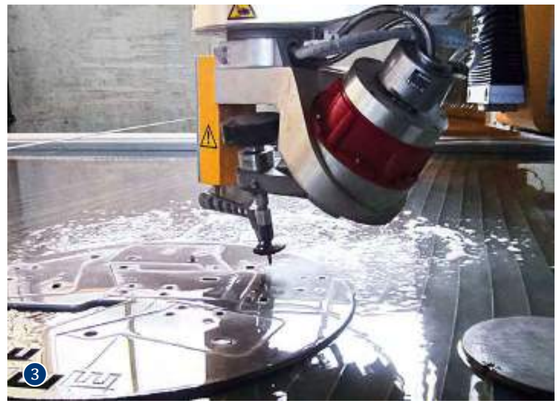
MicroStep delivered the complete cutting solution: with a 12 x 3 m large cutting area for plates up to 150 mm thick and a zone for cutting pipes with a robot situated along the outer side of the machine guides, the machine is capable of processing tubes up to Ø 2000 mm and wall thickness 80 mm.

Jose Pycke
Workshops Manager
Jan De Nul Group

"The plasma/oxyfuel cutting machine with integrated robot has resulted in considerable time saving because all the weld preparation is now done automatically and in one step which also increases quality."

Industry-proven beveling solutions

3D processing with plasma, laser, waterjet and oxyfuel



The area of bevel cutting has been one of priorities and an integral part of MicroStep's R&D for many years. We acknowledged the importance of this technology for streamlining of the production process and realized that many fields of the engineering industry would greatly benefit from its proper development. Thanks to our long-term focus and experience we were able to continuously innovate the equipment and, furthermore, develop new technologies that secured MicroStep a stable place among market leaders in bevel cutting.

According to field studies, up to 50 % of parts produced in the CNC cutting industry worldwide need to have beveled edges, yet only a considerably smaller percentage of machines is equipped with bevel tool stations. The reason may be the additional cost of this advanced equipment, but mainly it is still a relatively low awareness of decision makers in engineering companies about the possibilities, availability and reliability of contemporary beveling tool stations. The benefits – greater precision along with significant savings of production time and capacities – easily outweigh the higher initial investment. Moreover, in automated preparation of beveled edges on 3D objects such as domes, pipes, rectangular or IPE profiles, the use of specialized tool stations on gantry-based machines brings a great financial benefit compared to the commonly used robots.

Since the introduction of our plasma rotator in 2000 and a waterjet rotator in 2001, MicroStep has made continuous efforts to establish automated CNC bevel cutting as a common and highly efficient production technology for preparation of weld edges on different types of materials. Our goal is to deliver cutting machines that can produce cut parts with bevels in convincing quality and precision, yet the operation of the machines is kept reasonably simple. Throughout the years, improvements of mechanics and motion control of our rotary- and 3D tilting tool stations went hand in hand with the third-party development of energy-beam sources and our implementation of the latest cutting technologies developed by our suppliers. Thanks to this background, we are today able to offer a comprehensive bevel cutting solution for a wide range of materials and thicknesses.

Our comprehensive beveling function and supporting functions such as torch geometry calibration and adaptive bevel compensation allow our customers to cut bevels in a convenient way using different cutting technologies – plasma 1, laser 2, waterjet 3 and oxyfuel 4 – as well as to create bevels in a wide material thickness range reaching from 5 mm to 300 mm (depending on the used cutting technology). Furthermore, thanks to unique features of our in-house developed control system iMSNC and a profound knowledge of different cutting technologies, MicroStep machines are capable of combining various technologies (e.g. plasma and waterjet) within a single cutting plan 5.

MicroStep

Alexander Varga, Ph.D.
Head of R&D
MicroStep

"In the development of our bevel cutting equipment, the requirements of high precision, repeatability and long-term process reliability have always been at the forefront."

MicroStep machines provide two types of beveling processes:
DBP – Direct beveling process – represents the classic way of bevel cutting where the bevel is cut directly into the raw material (sheet 6, pipe 7, profile or dome). The cut edge of required shape – A, V, Y, X or K – is created via multiple consequent transitions of the cutting tool (at different angles) along the cut edge. MicroStep machines with two rotators allow cutting of two identical parts using two rotary heads at once 8. The current maximum tilt angle of supplied tool stations is: 52° for plasma, 45° for laser, 60° for oxyfuel and 45° for waterjet.

ABP – Additional beveling process – enables adding of bevels to parts that have already been cut with a straight tool by plasma, laser, oxyfuel or even waterjet (for further information see page 25).

Generally, the accuracy of bevel cutting is determined by mechanical accuracy of the cutting machine, accuracy of the cutting technology and the stage of development of applied algorithms of control of the torch distance from the cut material.
Apart from consistent use of high-quality components, the mechanical accuracy of MicroStep bevel cutting machines is provided by several advanced solutions:

ITH – Intelligent torch holder – ensures protection of the torch in case of an accidental collision. Its slip-back function ensures return of the torch into the correct position after elimination of the collision. The ITH body includes an advanced sensor system for detection of the exact torch position and provides also the endless rotation function.

ACTG – Auto-calibration of tool geometry 9 **–** secures that during rotation and tilting of a rotator the torch tip always stays in the required (exact) position. The ACTG system consists of a calibration station 10, a torch extension probe and advanced control software. ACTG eliminates the necessity of mechanical adjustment of the bevel head and significantly reduces setup time of the machine from several hours to a couple of minutes.

Compensation of longitudinal displacements – an optional function which ensures absolute accuracy of the cutting machine in the longitudinal direction. During installation, the machine is measured by a laser interferometer and the measured values are used for calibration of the positioning system. The measurement can be applied upon request in case of cutting of long parts with very high demand on accuracy.

Accuracy of the cutting technology is enhanced by eliminating beam deviations that occur naturally when the torch is in a tilted position in relation to the material and cause an unwanted difference of the cut angle from the theoretically programmed slope. 11

ABC – Advanced bevel corrections – a feature of iMSNC that enables implementation of databases of compensation angles and other values for various cutting technologies (e.g. Hypertherm's True Bevel™ technology or Kjellberg's PerfectBevel). The compensation values can also be adjusted directly by the machine operator.

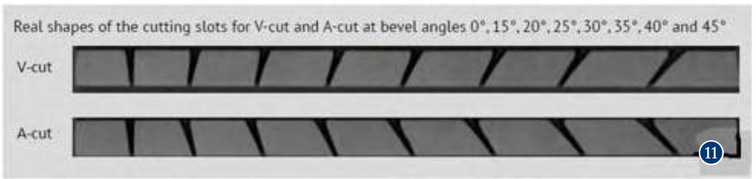
To ensure precise following of the material surface during plasma bevel cutting with the torch positioned always in the correct cutting height, MicroStep developed a smart height control system:

STHC – Self-teaching height control – a combination of 3D motion control, self-teaching algorithms and adaptive height control according to the plasma arc voltage. STHC ensures positioning of torch in the correct height at any angle (e.g. during cutting of variable bevels).

To achieve best possible efficiency of cutting program execution, MicroStep recently introduced tool movement optimization:

SZM – Smart Z movement – a combination of reduced parking with simultaneous positioning of cutting tool in X, Y, Z, rotary and tilting axes during transitions between cuts in order to minimize transition times 12. Depending on the cutting task, this feature can save up to 40% of processing time. Existing systems can be upgraded with SZM as well.

All the described functions greatly contribute to improvement of accuracy and efficiency of the bevel cutting process. Our almost 1000 beveling tool stations and 700 ACTG systems supplied in the field and first of all the excellent bevel cutting results achieved on MicroStep machines tell the story by themselves.



Additional Beveling Process

Efficient alternative to robots: MicroStep's patented ABP technology enables additional weld preparation directly on the cutting machine

Robots are widely regarded as the solution of choice when it comes to weld preparation and bevel cutting on already cut parts. With ABP (short for Additional Beveling Process) MicroStep introduced an efficient way of precise subsequent beveling that has proven to be highly efficient since it doesn´t require a separate machine to do the job, and the user also saves time for moving the parts for beveling to another workplace. All is done conveniently by utilizing the same cutting head and CAM software like for direct beveling.

Subsequent weld preparation is a standard way of processing cut parts in many areas of the metalworking industry. Manufacturers of machinery and materials for power plants, turbines, pumps, mining equipment and others often work with very large steel thicknesses, so the parts cannot be cut with bevels directly – either due to technology limitations or because it would mean a significant waste of material.

Adding of bevels made simpler

In case of big material thicknesses, automated weld preparation on parts has traditionally been a two-stage process. First, the desired contour was cut on a conventional cutting machine with a straight tool, e.g. by plasma or oxyfuel. Then, the part was taken out by the operator and moved to another workplace, where it was processed by a robot – in order to successfully add bevels, the part needed to be placed precisely on the workbench, and there needed to be prepared a separate cutting program for the robot for adding bevels.

"The initial question we asked ourselves was why you should require a robot for the subsequent weld preparation in the first place," explains Alexander Varga, development chief and co-founder of MicroStep. "Our cutting machines have all the means for achieving highly precise bevel cuts."

With this premise in mind, MicroStep utilized its long-term experiences in bevel cutting and process control for developing the ABP process – a technology that involves laser scanning of pre-cut parts along with software tools enabling user-friendly programming of additional bevels in a standard CAM environment. The process allows to cut additional bevels with the same bevel head like direct bevels, in a quality that doesn´t require further post-processing or additional machining steps – the parts can be used for welding straight away after ABP.

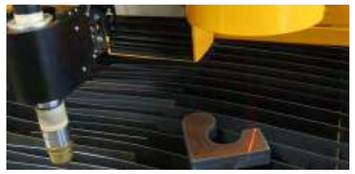
Enabled for all cutting technologies

To enable a MicroStep machine to use the additional beveling feature, the machine has to be equipped with one of MicroStep's bevel cutting tool stations and an additional scanner unit. The scanner can be attached to the bevel head from the side, integrated in the torch holder or mounted on a separate tool station – depending on the particular machine configuration and desired application.

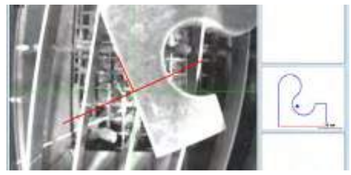
The process then unfolds as follows: First, a 2D drawing of the pre-cut part is imported into MicroStep's CAM software Asper®. The machine operator defines the required bevels in Asper's user interface. The system then generates a cutting program for additional beveling. To find the exact position of the part on the cutting table, the machine will use the ABP scanner. During the scanning process, the real contour of the part is compared with its drawing and if slight differences are detected (a real part is hardly ever completely accurate), the system will align the cutting program with the real shape to achieve the most accurate cutting result possible. After the starting point of cutting is verified, the cutting process begins. The process allows to cut V, Y, X and K bevels (whereby for K and X cuts the part needs to be turned and scanned again after the first cutting round is completed). Obviously, the technology allows to scan and process parts made with completely different technologies – for example, thick parts cut with oxyfuel can be subsequently beveled by plasma, or parts pre-cut with plasma can be cut with ABP by fiber laser. Thanks to MicroStep's unified bevel cutting equipment and its easy setup via the patented ACTG® technology, the ABP process is fast, reliable and easily applicable to all cutting technologies – plasma, laser, waterjet as well as oxyfuel.

Advantages of ABP

Compared to additional processing of pre-cut parts with a robot, the patented ABP technology offers several clear advantages: the complete process (2D cutting and additional beveling) can be done with the same machine – this saves space in production and, above all, the time that is otherwise spent with part manipulation. In addition, the cost of adding a laser scanner to a MicroStep cutting machine is significantly lower than the investment in a separate, dedicated robotic workplace. On the other hand, cutting results that can be achieved on a gantry-type machine are more precise due to the generally higher rigidity of the cutting machine.



ABP scanner determining the exact position of a part placed on a random spot on the cutting table.



During the scanning process, the real contour of the part is compared with its ideal shape (drawing).

With beveling technology from MicroStep, V-, Y-, and (under certain conditions) also X- and K-cuts can be added to already pre-cut parts.

Thanks to high rigidity of the cutting machine, the cutting results are finer and more precise than with a robot.

Close-up view of a cut part with added bevels.

EXTRA

ABP for stainless steel and aluminium

ABP with plasma can be used for not only mild steel parts but also for stainless steel or aluminium. As an example, the 15 mm thick stainless steel part pictured above was beveled in a 130 A plasma cutting process.
"The dross is easy to remove. The technology provides impressive results. Especially with stainless steel, it saves a lot of material and also handling costs," says Alexander Varga, development chief of MicroStep. "For bigger thicknesses, the material savings achievable thanks to ABP are very attractive."

ABP
Video presentation:

www.microstep.eu/video

Beveling going thick

Oxyfuel bevel heads opened up new possibilities in 3D processing of thick steels

The integration of oxyfuel technology in MicroStep's rotary bevel heads creates new application areas especially where complex contours with multiple bevel cuts in larger material thicknesses are required. Paired with innovative solutions such as ACTG® and ABP, the new technology proves to be highly efficient and precise.

The efficiency of bevel cutting of thick metals is determined by several factors: energy and gas consumption, wear of consumables (cutting nozzles), cutting speed, number of cuts needed to achieve the desired cut profile (for X, Y, K cuts), the possible need for additional material handling between individual cuts and, last but not least, by the volume of waste material that doesn't belong to the final cut part but also degrades in the cutting process. The quality of the cut is given by the limitations of the technology itself and, in case of thicker materials, also by its ability to cut through the material of a certain thickness at all. A sustainable production technology needs to be well balanced between these two – efficiency (cost) on one hand and cut quality on the other.

Limitations of oxyfuel triple torches

In today's industrial applications there are commonly cut materials up to a maximum thickness of 50 mm by plasma, utilizing rather high cutting currents 400 – 450 A. In case of bevel cutting, applications from 35 – 40 mm thick tend to be the limit for plasma already: thicker mild steels are traditionally bevel cut by oxyfuel triple torches which allow making two or three cuts at once, creating Y or K cut edges in one go. Triple torch technology has certain drawbacks though – the geometry of the torch setup doesn't allow cutting some types of contours (especially internal beveled edges), the bevel angle is limited to max. 50° and, overall, the maximum material thickness for bevel cuts is limited to 80 mm, making it suitable just for certain applications.

To overcome these limitations, MicroStep came up with an elegant solution: why not integrate an oxyfuel torch into its existing rotary bevel head design and enjoy the already developed and established features from plasma also for oxyfuel?

Introducing the oxyfuel rotator

The MicroStep rotator is a 5-axis 3D bevel head with endless rotation and a tilt up to 52° (for plasma torches) that has proven itself in hundreds of installations worldwide. Thanks to the torch pivot point being aligned with its rotary axis, the design is well suited for cutting a great range of bevel shapes including internal contours, variable bevels as well as multiple bevel contours Y, X or K. For oxyfuel, the head has been modified to include an endless gas transmitter, a tactile height measurement system and, most significantly, the torch tilt was increased to 67° which allowed to make use of the generally narrower and pointier oxyfuel torches for cutting material at bigger angles. Compared to triple torch cutting, the advantages are obvious: maximum material thickness for direct beveling increased above 120 mm (depending on application and bevel angle even up to 200 mm), the cut angle increased to a full 0° – 60° range compared to the 20° – 50° range for triple torch. The AC geometry of the bevel head allows to cut significantly smaller radiuses on holes and internal contours, e.g. for thick pipe intersections. Furthermore, oxyfuel rotator with an integrated laser scanner can use Additional Beveling Process (ABP) which greatly expands the possibilities of beveling thick sheets on a cutting machine.

Multiple material and gas savings with ABP

The principle of additional beveling is that the part is firstly cut straight, afterwards it is taken out of the sheet, placed on a free spot on the cutting table, scanned for exact contour/position and, subsequently, bevel cuts are added to the contour. For oxyfuel this means that really thick parts (~250 – 300 mm) can be produced with clean bevels with angles ranging up to 60 – 65 degrees – with great saving of gas and material. For Y or K cuts, with ABP the effective bevel cut thickness is significantly smaller compared to direct beveling into a full sheet, which allows to cut bevels much faster and with multiple saving of the cutting gas. Higher cutting speeds also mean that there is a smaller heat-effected zone in the material, i.e. better quality of the final part. The necessary additional part handling times with ABP can be offset by having a machine with multiple straight gas torches, and using ABP on multiple parts in one sequence.
Secondly, with ABP there is no additional material waste from the unused part of the bevel cuts because the beveling is done on an already cut contour with no material around it. This presents a significant material saving especially for bigger thicknesses and higher bevel angles. Not to mention that compared to other methods of additional beveling – e.g. using one cutting machine for straight cutting and a separate robot workplace for beveling – the use of one machine for all operations is much more efficient and comes with much lower initial cost.
A real case study has shown that with such a combined MicroStep machine for thick sheet cutting it was possible to achieve time savings in production of up to 85%.

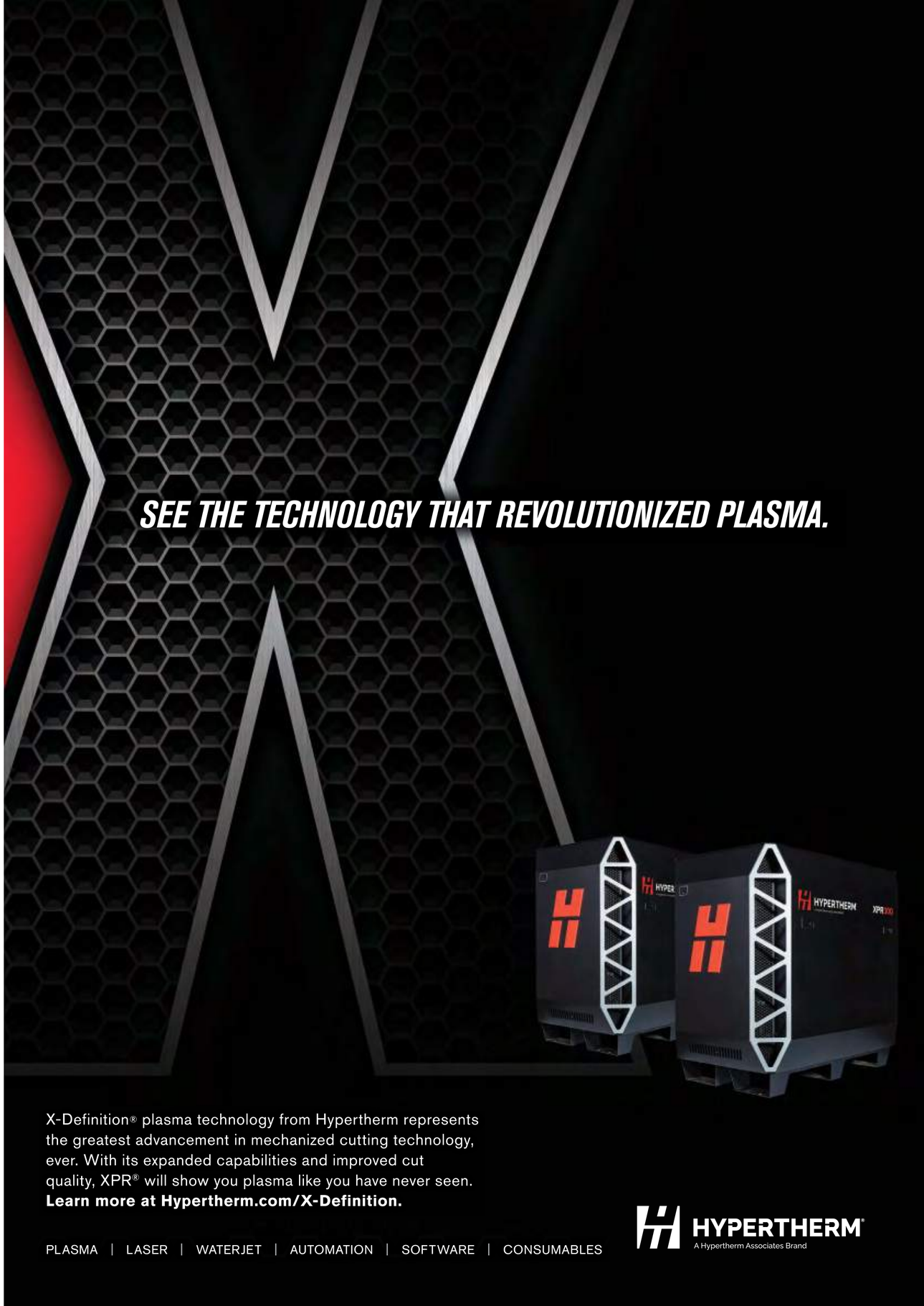
Oxyfuel rotator for weld preparation on thick metals utilizes MicroStep's patented ACTG® technology for automatic compensation of kinematic inaccuracies, and thus delivers reliable cutting results in the long run with a far less frequent maintenance necessary.

Oxyfuel triple torches make K-cuts in one go but lack the ability to cut really thick

The leading Spanish machine manufacturer Solintal took advantage of MicroStep's oxyfuel rotator and ABP in a big way: the needed steel parts of up to 160 mm thickness with complex bevels on non-linear contours that previously took 6 hours to produce are now ready in 45 minutes.

Oxyfuel bevel
Video presentation:

www.microstep.eu/video



Partnership with mountain conquerors expanded

Cutting with CNC machines, welding with robots: this is only possible with the highest precision in bevel cutting and, according to Doppelmayr, that is a unique feature of MicroStep

The Doppelmayr/Garaventa Group climbs to the highest and most remote corners of the earth, transporting skiers, vacationers or daily commuters. For 17 years, the market leaders in cable car construction and MicroStep have maintained a close partnership. In the hunt for steady improvements, their reliable production line has been recently completely renewed. Thus, Doppelmayr increased its flexibility in cutting, its precision and the production speed.

A turquoise shimmering sea, glittering sandy beaches, palm-covered islands - the sight that Vietnam vacationers have been enjoying for a few months on a ride on the longest cable way in the world is peerless. 7,899.9 meters connect the two holiday islands Phú Quốc and Hòn Thơm in the south of the country and, at the highest point, the cable car takes visitors to 164 meters. This is just one example of Doppelmayr/Garaventa Group's projects. The company's history is characterized by innovations, records and superlatives. Adjectives such as "longest", "greatest", "highest" and more adorn the headlines of richly illustrated articles in newspapers and magazines. Cable ways open up remote corners of the globe at lofty heights and connect people with cities and nature through innovative transport solutions. In 95 countries on six continents, several thousand cable car installations are in use every day. It is no coincidence that the company has been the market and technology leader for more than half a century. "Foresight, trend recognition, innovation. These are the strengths that Doppelmayr's customers can rely on. We have been working together well with many of them for decades. This enables us to set milestones again and again," says Walter Eberle, explaining the strengths of the group. He works as a deputy production manager in production planning at Doppelmayr's headquarters in Austrian Wolfurt on Bodensee Lake.

Exciting projects can only be implemented with modern technologies

There are always new and exciting projects on Eberle's desk. The market demands ever shorter delivery times for increasingly individualized solutions. "As a market and technology leader, it is of course our goal to always maintain the highest technological level. To achieve this, it is necessary to keep relying on new technologies in production," says Mr. Eberle.

The Doppelmayr/Garaventa group has experienced another such success in the recent past. During the last two years, their entire cutting department has been fundamentally modernized. The global group relied on MicroStep's solutions – as has been the case for more than 15 years now. At the turn of the millennium, Doppelmayr was looking for a suitable job cutting provider but was unable to find one that could make the up to 5,000 parts they needed daily. "So, we had to search for a supplier of cutting equipment and, fortunately, ended up at MicroStep," Mr. Eberle looks back. The decision was easy to make: Doppelmayr wanted a single supplier for software, controls, drilling and cutting machines. MicroStep was the only company to offer such complete solution. And so, the 60-meter-long production line did almost two decades of good work – until came the time to modernize it. The main requirement was to increase the precision of bevel cutting so that no problems would occur during subsequent automated robot welding. In addition, the new purchases should provide more flexibility, productivity and efficiency. "Our cutting process needs to be very accurate because we then weld about two thirds of the components with robots. That's why we need a tolerance of maximum ±0.5 mm here. This is a very, very high requirement for this thermal process," emphasizes Walter Eberle.

For the company Doppelmayr MicroStep installed a powerful drilling machine of the DRM series 1 and two plasma and oxyfuel cutting machines of the MG series with two gantries 2 + 3 each. The two MG machines are each equipped with a CCD camera 4 for maximum precision when cutting pre-drilled parts.

Leading technology, good experience and service proximity all speak for MicroStep

With that in mind, the decision-making group of Mr. Eberle and other production managers searched extensively on the market, visited trade fairs and took a close look at technology demonstrations. In the end, the decision fell again on the world's market leader in automated plasma cutting. "There were several criteria that were crucial. We have had good experience together for fifteen years, the service proximity of MicroStep in Bad Wörishofen was also an advantage and in terms of bevel cutting quality, MicroStep has a unique selling point when it comes to complying with the required tolerances."

In mid-2016, the production line was gradually renewed. Implemented were: a drilling unit with a gantry and automatic tool changer 1 and two cutting machines with a total of four gantries. Three cutting gantries 2 + 3 are each equipped with a plasma rotator, a 2D plasma cutting head and two oxyfuel cutting heads. The fourth cutting gantry has four cutting heads for parallel oxyfuel cutting 5. "It worked the way it was supposed to from day one," says Mr. Eberle. The three identical cutting gantries bring more flexibility. Doppelmayr has cut about 13,000 tons of sheet metal every year in the recent past. According to Mr. Eberles's estimate, 18,000 tonnes in a three-shift operation are now possible. "We will cut more in the future. When we build more products, we need the capacity in order to cover the ever increasing number of production peaks. This is the first step in production and we must not fall behind. So we still have a good reserve for the future," says Mr. Eberle.

Special solution saves manipulation time and increases precision

Each of the two cutting machines was also equipped with a CCD camera 4. This determines the exact position of holes already drilled into the plate, on which the nested cutting plan is then automatically aligned. As a result, the material can be precisely cut in exactly the correct relation to the already drilled holes. "Because all of these technologies are available to us on one production line, we save on a lot of time-consuming material handling that is without added value," explains Mr. Eberle.

The entire production line has been completed by commissioning of the last machine in December 2017. Ever since, it has been running in a multi-shift operation from day one. It was a worthwhile step for Doppelmayr/Garaventa Group. Walter Eberle is convinced of this – after more than 15 years of cooperation. "It distinguishes the company, shows that it seeks progress and does not rest on the deserved success and continues to look for what can be improved."

Walter Eberle
Production Planning
Doppelmayr Seilbahnen GmbH

"We have had a good experience together for fifteen years. When it comes to bevel cutting quality, MicroStep has a unique selling point in complying with the tolerances required for robot welding."

One of the four cutting gantries at Doppelmayr is equipped with four oxyfuel cutting heads for cutting of big material thicknesses. The more than 60-meter-long production line runs in three shifts at the headquarters of the company in Wolfurt (Austria) near the Bodensee Lake.

Doppelmayr
Video presentation:

www.microstep.eu/video

Precise countersinking on a MicroStep machine achieved thanks to plate distance sensors integrated in the pressure retainer on the drilling tool station.

True multifunctionality with machining operations

Drilling and milling solutions turn MicroStep cutting machines into multifunctional production centers

To supplement its cutting and marking technologies, MicroStep delivers a comprehensive line of drilling, tapping, countersinking and milling solutions that can be integrated within the same CNC machine, and in many cases even on a single gantry.

Fabrication processes often need high-precision holes, threads, or countersinks on parts. Whether it is flanges, end plates, heat exchanger tube sheets and generally any stress-exposed bolted joints, there is a fair number of applications where it is technologically necessary to make the holes by drilling. And while there are jobs – especially those with large quantities of holes in a single workpiece or assembly – where using a dedicated boring machine is most efficient, there are also many parts with just a couple of holes in them and perhaps some threads 2 that are usually done manually, or in a separate mechanized drilling process, just for the lack of a better option. For these occasions, the ability to create parts on a single machine including cut contours, markings and machined holes makes the most sense economically.

Automating technological operations

Moreover, integrating several technologies into a single multifunctional gantry 3 allows the technological processes on a semi-product – be it plate, profile, beam, or a pre-welded assembly – to be automated within one NC program. It is not only the automatic tool exchange, but also automatic switching between the different technologies, setting the sequence of operations for each part in advance while taking into account thermal expansion of material, and overall, the ability to set the most efficient process for producing of parts with the desired accuracy while having access to a combination of technologies. Input here is the raw semi-product – e.g. a metal plate loaded on the cutting table – and output are already finished parts that can have contours cut with straight edges up to complex bevels (without dross), drilled and countersunk holes, cut threads 2 and laser marked data matrix codes for identification. The parts can then go straight to welding, blasting or whatever the production process requires next.
The customer achieves a significant increase in efficiency through reduction of technological steps (e.g. no need for deburring or manual grinding of cut holes), eliminates transfer of parts to different workstations (e.g. to a separate drilling station or a manual beveling workplace) and saves labour and time through automation. Additionally, initial investment in one multifunctional machine is less than into two or more machines, and also less floor space is required.

Drilling, tapping, countersinking – well tuned and field tested

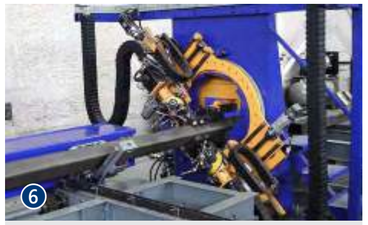
During the past two decades, MicroStep supplied hundreds of multi-functional machines with drilling capabilities, combining mostly plasma bevel and oxyfuel cutting with machining operations. The solutions include small drills up to Ø 13 mm as well as more rigid units with spindle powers 11 kW – 55 kW that cover drill diameters up to Ø 30 mm, Ø 40 mm and Ø 60 mm for drilling up to 100 mm thick plates. Pre-drilling units Ø 12 mm for thick oxyfuel piercing up to a 300 mm plate thickness are also available. The most popular choice is a 26 kW drill with diameter range Ø 4 mm – Ø 40 mm, countersinking and tapping up to M33 4.
The drills come with automatic tool exchange and internal and external cooling of drill bits as well as with damage protection in case of tool breakage. High precision of countersinking is ensured by two incremental sensors in the pressure retainer that measure the distance between the plate and the countersinking tool 1. The equipment includes automatic drill length calibration (ACDB technology) and supports various drilling cycle types including peck drilling.

For heavy-duty drilling operations in the field of automated production of flanges, gussets and end plates, plate processors such as the MicroStep's DS series 5 are the common solution. These machines are capable of fully automatic operation with automated loading and unloading of material and come with work area cleaning by a brush and automatic removal of drill chips. For automated drilling and tapping of profiles with square or rectangular cross-sections, the profile processing line DS-B 6 with two drilling heads rotating on a slewing ring is the ideal solution. The machine provides simultaneous drilling and marking of two opposite sides of a profile while the material is loaded and unloaded automatically.

For milling and routing operations on steel parts, MicroStep delivers its flagship multifunctional CNC machine with an independent sub-gantry and a powerful retainer that allows milling and drilling up to Ø 70 mm – the DRM Max series (see EXTRA).

Hardox part drilled, tapped and bevel cut with plasma on a MicroStep DRM machine.

A multi-functional MicroStep machine with drilling up to Ø40 mm (+ tapping and countersinking), inkjet marking and a special plasma bevel head up to 120 ° tilt angle and endless rotation for plate, pipe beam and dome cutting.



Profile drilling line DS-B allows simultaneous drilling, tapping and marking of rectangular hollow sections up to 12 m long and 300 mm wide.

MicroStep drilling head with internal cooling and automatic tool change, with automatic tool magazines for 16 tools.

Plate processing line MicroStep DS with a 55 kW drill dedicated to automated production of flanges.

Calibrating a turret drill head on a MicroStep fiber laser machine with drilling/tapping/countersinking option.

Drilling
Video presentation:

www.microstep.eu/video

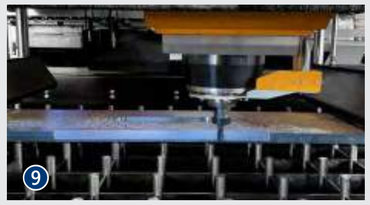
Dr.-Ing. Alexander Varga
Head of R&D
MicroStep

„Integration of machining technologies significantly increases productivity of our cutting machines."

Features & benefits of MicroStep drilling solutions

- Fully automatic drilling, tapping and countersinking
- Wide selection of drilling tool stations
- Wide drill diameter range of particular drills
- Auto-calibration of drill bits (ACDB) technology
- Automatic tool exchange for up to 16 tools
- Modular solution – can be combined with other processing technologies

EXTRA: DRM Max | Heavy-duty cutting, drilling and milling solution



DRM Max is MicroStep's flagship in machining operations – a heavy-duty CNC cutting, drilling and milling machine 8 with key applications in offshore, wind tower, heavy vessels, columns, reactors and other heavy-duty machinery segments. Its gantry has a rigid double-beam structure with an independent sub-gantry carrying a 55 kW spindle and two powerful retainers that clamp down with 24,000 N each, over a 750 mm wide drilling and milling area 9. This robust machine design enables drilling up to Ø 70 mm and a variety of milling operations such as large hole milling, face milling, pocket & slot milling, chamfer milling, thread milling or counter boring 10.
DRM Max can be also equipped with other accessories of the DRM series enabling plate, pipe, beam and dome cutting applications.

Features & benefits

- 750 mm wide drilling and milling area
- 2 powerful pneumatic retainers
- Minimal chip-to-chip time
- Fast processing & tool exchange
- Automatic internal and external tool cooling, tool exchange magazine, cleaning of processing area, drill length calibration (ACDB technology)

EXTRA: Drilling and milling solutions complementing different cutting technologies

Plasma and oxyfuel machines

Integrating drilling solutions into plasma and oxyfuel cutting machines makes a lot of sense since metal parts produced from mid-range to higher thicknesses often contain holes, threads or countersinks. For very thick materials (~ 300 mm), drilled holes can be used as material piercings for subsequent oxyfuel cutting. MicroStep drilling solutions cover a broad range of diameters between Ø 4 – Ø 60 mm (and even Ø 70 mm in case of DRM Max, see EXTRA) and taps between M4 – M33. Tool magazines for up to 8 tools 11 with a possibility to have them coupled up to 16 positions allow for automatic switching of tools within a single cutting plan.

Lasers with drilling

It's not only plasma and oxyfuel machines that bring the advantage of a multifunctional design, but also MicroStep's waterjet and fiber laser machines. For the latter, a turret head with 6 tools and automatic drill bit calibration 7 provides drilling up to Ø 20 mm, tapping up to M16 and countersinking while a stronger drill up to Ø 30 mm is available for MSF Max machines with standard suction tables (without pallet changers).

Waterjet with tapping

Waterjet machines do not usually come with drilling feature because the technology is precise enough to cut holes with sufficient quality. MicroStep supplies small-diameter pre-drilling units though. They are used for piercing of sandwich material whose inner structure would otherwise erode if pierced directly by the water beam. Bigger spindles are used for tapping of holes after they are cut by water. MicroStep supplies tapping tool stations up to M16 for its AquaCut series.

A custom MicroStep machine doubled the productivity at EBAWE

Manufacturer of complex production systems relies on a combined CNC drilling and cutting center from MicroStep – „The machine does exactly what it is supposed to“

A system that can reliably mark, cut, drill and tap – and all of this with extreme precision, even on particularly large workpieces: EBAWE Anlagentechnik GmbH, based in Eilenburg in Saxony, has chosen MicroStep as the right partner for this challenge.

Concrete is trending these days and is considered as a versatile material with a rough charm. Its usage worldwide, ton for ton, is twice that of steel, wood, plastics, and aluminium combined. The customers of EBAWE Anlagentechnik GmbH benefit from this trend greatly. With help of the company's technological know-how they manufacture walls, ceilings, stairs and much more from this highly flexible and durable material. For more than 60 years, EBAWE has been developing, manufacturing and installing complete production systems for the industrial manufacture of a wide variety of precast concrete elements.

EBAWE production systems for concrete processing are in world-wide demand and extremely complex. Their installation often requires several thousand square meters of space. At the same time the machinery needs to work with utmost precision since production of prefabricated concrete elements requires high levels of accuracy. "In order to be able to cast concrete parts, we have to produce a so-called mold palette for it. This is basically a base plate onto which the side formworks are applied to make a mold for the casting process," explains Pierre Winkler, Production Manager of EBAWE.

These mold palettes are usually made from 8 mm thick special metal sheet , which in some cases have dimensions up to 18 meters in length and 4.80 meters in width depending on how large the finished concrete part should be.

At MicroStep, the needs of the customer were taken seriously from the beginning

"In the past, we have already used a thermal cutting system to produce all the different molds. However, the productivity of the old machine has reached its limits in recent years," says Winkler. Therefore, EBAWE has started looking for a new, faster and more efficient alternative for the production of mold palettes. „We were not sure if we could find a suitable partner who can fulfil our requirements and implement it the way we imagine it," says Winkler. In the end, after a comprehensive internet research and multiple exhibition visits, the choice fell on MicroStep. "From the beginning, we had the feeling that our needs were taken seriously and that our special requests were also taken up."

„Drilling speed has significantly increased compared to the old system"

EBAWE has decided for a solution that can handle several tasks at once. The work area is 50,000 mm x 5,500 mm and it has two gantries, enabling loading, unloading and processing of several components simultaneously. The first gantry was supplied by a company that specializes in grinding solutions. In the first step of the process, it ensures that the surface of the mold pallete is smoothly grinded – as for the exposed parts of the concrete cast it is important to have a uniform surface structure. Afterwards, the second gantry – MicroStep – marks the processed part with plasma, indicating the spots where the side formworks should be welded on.

The same gantry can also drill holes with threads, another option to attach formwork elements. "The drilling speed has increased significantly compared to the old system and the fact that we are now able to do the tapping on the same machine is another great advantage," says Winkler.

In the end, the parts are finally cut by plasma. Especially with particularly large mold palettes which can have an edge length of 10 meters and more, it is extremely important that the deviations from the set zero point do not exceed a maximum of ± 0.5 mm over the entire length. And that was achieved thanks to innovative solutions from MicroStep. With this new system, EBAWE has doubled its productivity in the manufacture of mold palettes. „Everything worked out right from the beginning and the cooperation with MicroStep ran very smoothly," says Pierre Winkler. The machine does exactly what it is supposed to.

Pierre Winkler
Production Manager
EBAWE Anlagentechnik GmbH

EBAWE WE FORM YOUR CONCRETE

„The drilling speed has increased significantly compared to the old system and the fact we are now able to do the tapping on the same machine is another great advantage."

Beveling and drilling are crucial

The job shop Prinzing invested into a plasma and oxyfuel combination with a handful of complementary technologies

The combined plasma and oxyfuel cutting solution at MAP Prinzing Brennschneidtechnik GmbH enables bevel cutting with plasma, 2D oxyfuel cutting, drilling, tapping and marking on two gantries. At the request of the company, a tool magazine for 16 tools was added.

In order to renew its machine park and to become faster and more flexible in production, the Baden-Württemberg based company MAP Prinzing Brennschneidtechnik GmbH was looking for new cutting machinery. The job cutting business found their solution at MicroStep – and invested into a complex CombiCut machine. This multi-functional system enables bevel cutting with plasma, 2D oxyfuel cutting, drilling, tapping, countersinking and marking with a powerful combination of two gantries.

About 50 kilometers east of Stuttgart in Germany lies the Baden-Württemberg municipality of Gingen an der Fils. Here, a modern job cutting company is operating their production facility. Small-sized locksmiths as well as large steel construction companies rely on the products of MAP Prinzing Brennschneidtechnik GmbH. Thanks to decades of experience, the contractor produces parts from small batches of 1 up to 500 pieces. All this with innovative machines that make Prinzing Brennschneidtechnik ready to handle even the most urgent orders. These are usually handled with a two-shift operation and, if necessary, a third shift may be added on short notice.

The most common tasks for this sheet metal service include production of custom parts using plasma and oxyfuel cutting technologies. On average, 300 tons of raw material are processed every month. Prinzing Brennschneidtechnik has recently invested into a multi-functional cutting system which offers a multitude of processing options. After an extensive search for the right cutting solution, Hans Prinzing's management has decided to purchase a combined plasma and oxyfuel machine with supplemental drilling technology. "We looked at the entire market and also attended several technology demonstrations. All the technology combinations were known beforehand. The decisive factor for MicroStep was the bevel cutting equipment and the drilling unit. The drill was the most powerful among all competitors," Hans Prinzing looks back.

And so, in order to achieve maximum flexibility in production, the company Prinzing opted for a special solution which integrates two gantries in one cutting machine over a table sized 24,000 x 3,000 mm. The first gantry is equipped with a plasma rotator for bevel cutting and two straight oxyfuel cutting heads for parallel cutting of thicker materials. The drilling spindle enables drilling of holes up to 40 mm in diameter and tapping up to M33. At the request of the company, a fully automatic tool magazine for 16 tools has been added to facilitate the wide range of jobs to be done on the machine.

The second gantry also contains a drilling unit for drilling up to 40 mm, tapping up to M33 and countersinking. In addition, there are another three 2D oxyfuel cutting heads and a punch marker. "There were no problems with the commissioning even though our existing table was integrated together with our suction system. We are satisfied with the performance, the drilling works great," concludes Mr. Prinzing.

Hans Prinzing
Managing Director
Prinzing Brennschneidtechnik GmbH & Co. KG

MAP Prinzing Brennschneidtechnik GmbH

"The decisive factor for MicroStep was the bevel cutting head and the drilling unit. MicroStep's drill was the most powerful among all competitors. We are satisfied with the performance."

„A huge advantage!“

Eberle Metall relies on a MicroStep 3D waterjet cutting system to cut its wide product portfolio

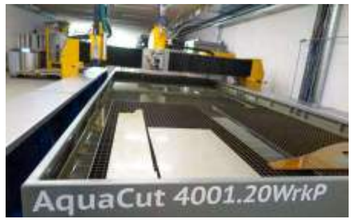
Architects, bakeries, dairy farms, churches; the customer base of Eberle Metall in Austria is as diverse as the range of its services. Turning their ideas into completed deliveries often employs the creative potential of Josef Eberle and his team. To gain more flexibility for their production, the family-owned business invested into a combined waterjet-plasma cutting machine with a waterjet bevel head for cutting a wide range of materials. “That is a huge advantage for us”, says Josef Eberle.

Anyone who uses the services of Eberle Metall in Hittisau, Austria, is looking for something special. This is because the relatively small company of eleven employees does not produce goods off–the-shelf. The versatile company led by Lukas and Josef Eberle serves a wide range of customers and industries. Just recently, Eberle Metall made all the brass ornaments for the Bildstein basilica, enameled furniture for a bakery and a 6-meter-high fountain for a main square. The creative ideas for these projects often come from the company itself – construction, production and assembly are all carried out by specialists from Eberle. “We are definitely not a serial producer or a subcontractor. We manufacture custom pieces. Our employees are so good that we can do almost anything. They are highly skilled and not afraid to experiment,” the owner Josef Eberle explains.

Company grew through apprenticeship support

Dairy farms also appreciate the state-of-the-art designs delivered by the 1949 founded family business. Eberle develops, manufactures and assembles the entire equipment for small alpine dairies within a 500 km radius. Almost all employees started as trainees and worked their way up in the company – one could say that Eberle Metall grew thanks to apprenticeship support. Following the company philosophy that “no one grows up as a specialist”, every worker tries out every job and learns to operate every machine. For the workforce this means a welcome change in the routine and it also frees the company from dependence on the know-how of an individual employee.

Eberle Metall’s previous waterjet cutting machine – also a MicroStep – has been on duty for about 20 years, involved in almost all of their productions. A decision to replace it with a newer model with additional features finally came in 2018 and by June 2019, a brand-new waterjet-plasma cutting machine from the AquaCut series was put into operation, equipped with a waterjet bevel head for 3D cutting and a 2D plasma cutting head. „We wanted waterjet for sure for its flexibility, to cut the inner countours, and afterwards switch to the much faster plasma. That was our idea. And the plasma works nice and well“, says Jozef Eberle. It is a great advantage to be able to cut almost everything in-house. 98% of the cutting jobs are done for Eberle’s own production. “Many special projects that we conduct often require a new part in the process. With the technology in house, the employee just goes to the machine, cuts the necessary part and is able to continue working on the project just a few minutes later. That is of a really high value“, says the trained artist-blacksmith. The other advantage is a well-stocked warehouse. The most common materials the company processes with the AquaCut are within a 1 to 25 mm thickness range: steel, brass, stainless steel and sometimes also aluminum, in rare cases also glass and copper. “The machine runs well so far. If it lasts like this for another 20 years, we will be very satisfied. We count on that it does“, concludes Eberle.



Josef Eberle
Owner
Eberle Metall

„It is a big advantage to do almost all the cutting in-house. If this machine holds also for 20 years then we will be very satisfied.“

A good experience

Metallbau Striegel have decided for a waterjet-plasma cutting combination with a pipe processing option

Maschinen- und Metallbau Striegel GmbH from southern Germany supplies its customers from many different industries with a wide variety of products. In order to fulfill all the orders on time, the managing director Joachim Striegel has decided to invest into a combined CNC waterjet-plasma cutting machine from MicroStep.

Kenzingen, 30 kilometers north of Freiburg is often called “Pearl in Breisgau“. More than 10,000 inhabitants and many visitors like to stroll through its historic old town and it is also the place where employees of Maschinen- und Metallbau Striegel GmbH go about their work with great passion and skill. In 1991, Joachim Striegel founded the company because he always wanted to stand on his own feet as he revealed during the interview. Striegel’s customers appreciate the results of cutting and joining steel and stainless steel as well as their production of complete assemblies. “If someone needs quick help, then they come to us,” says Managing Director and founder Joachim Striegel.

The requirements are as diverse as the customers: pharmaceutical industry, food and beverage industry, tunnel technology or heavy engineering. The expectations Joachim Striegel and his team have to meet are very high. The company has corresponding demands on its machines. About ten years ago they started to use waterjet cutting.

Later on, Striegel invested into a plasma cutting machine from MicroStep. However, over time, the solution with two cutting machines utilizing different technologies proved to be no longer adequate because operation and loading took too much time and limited the production. And so, Striegel considered several offers for new equipment and eventually decided to invest into a combined CNC waterjet-plasma cutting machine from MicroStep. “I made that decision because I had good experience with MicroStep.”

The AquaCut 6001.30WWrkP from MicroStep is equipped with a waterjet rotator for cutting bevels up to 45°, a second straight waterjet head and a plasma cutting head for underwater cutting. It also has a pipe cutting channel. With a large work area of 6,000 x 3,000 mm the machine can bevel cut and mark plates and pipes of various sizes. The machine runs seven days a week from 7 am to 11 pm. Mr. Striegel is satisfied: “The new machine is exactly like I imagined it.”

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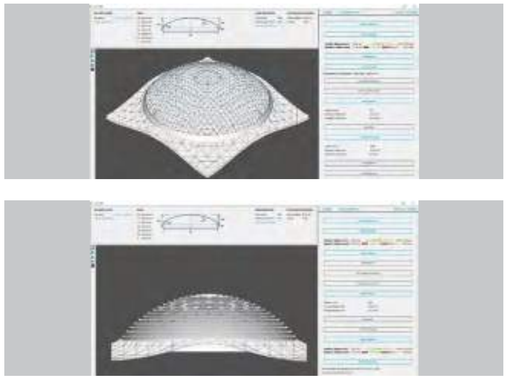
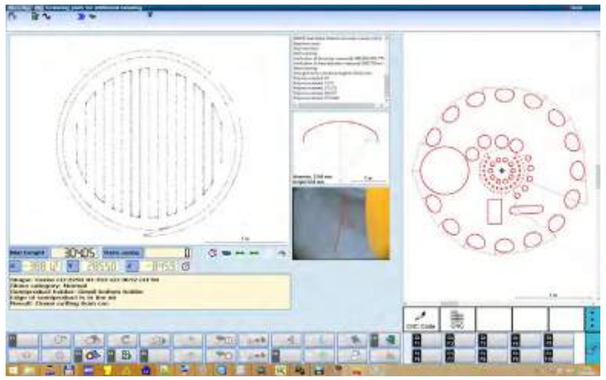
Dome cutting expert

mScan: Unique technology sets standards in high-precision processing of dished ends for less rework





Thanks to the mScan technology, the 3D scan of a dome enables to determine production-related deviations from the ideal contour that then could be compensated for accordingly during cutting.

Production of pressure vessels and boilers counts among the major industrial applications where cutting of 3D objects comprises an essential part of the production process. The obvious requirement is to make this process fast, simple to setup and, most importantly, with an accurate result that won´t need further mechanical or even manual processing. Typical cutting tasks in this regard are cutting of openings in a dished end of a vessel for welding of inlet pipes, slicing of a dished end or trimming of the edges of a dished end with preparation for its welding to the vessel body. The cross-sections of the cut edges must meet the requirements of the subsequent welding process – in other words, depending on the wall thickness of the cut object, the V-, X- or K-cuts with constant or variable bevels need to be produced with the prescribed accuracy, possibly in a fully automatic process.

For such tasks MicroStep has developed a special beveling tool station that enables tilting of tool up to 120° while having a big enough stroke to reach across the whole dome surface. Furthermore, MicroStep has newly introduced an advanced 3D laser scanning process and a corresponding point cloud mapping software – mScan – that enables a CNC cutting machine to measure the true shape of a 3D object, e.g. a dome, and use this measurement for adjustment of the subsequent cutting process so that contours and openings are cut in the needed positions on the surface with a very high precision – compliant with the production requirement.

Needless to say, implementation of such 3D scanning technology greatly contributes to increasing of the accuracy of the dome cutting process, as the real dimension of a dome can lay within – at least – allowed tolerances which in fact means that the real and ideal shapes of domes sometimes differ by several centimeters. Conventional methods of positioning corrections via control of plasma arc voltage are thus not applicable in case of 3D cutting. Implementation of a scanner on the other hand makes it possible to create a model of the actual dome surface within the coordinate system of the cutting machine and to subsequently use this model to analyze the shape of the dome, identify its center and define the exact toolpath above the surface. How does it work?

During the scanning process, the iMSNC control system receives data from the scanner and pairs it with positions of all motion axes of the machine in each moment. The measured positions are further adjusted by applying displacement corrections of particular axes positions (based on the exact measurement of machine kinematics by a laser interferometer) as well as the calibration data of the bevel head and 3D scanner itself (obtained via MicroStep´s patented auto-calibration technology ACTG).

MicroStep®

Alexander Varga, Ph.D.
Head of R&D
MicroStep

"With mScan technology, we can achieve unprecedented precision in dome cutting."

High quality results and big time savings by processing domes with many openings and welding preparations.

As a result, the control system has information about the exact position of the scanned object with respect to the cutting tool and thus enables exact scanning of this object within the coordinate system of the particular cutting machine. The scanner then uses mScan to create a detailed surface representation (3D model) of the object from point cloud while fully describing its parameters including its deviations from ideal shape.

MicroStep´s 3D CAM software mCAM is then used to map the generated cutting path (meaning the ideal cutting path created for the ideal shape of the object based on its STEP model) onto the real scanned object. Subsequently, a new cutting plan is generated to fit exactly the true shape of the scanned object. All the described automatic processes are conveniently displayed for the operator in the form of 3D visualizations on the control system screen. Depending on the dome size, this whole process, which is carried out prior to the actual cutting, takes from 2 to 10 minutes.

Of course, there are cases where it isn´t necessary to perform the whole process and thus the time is significantly decreased. In case the customer needs to measure just the dimensions of dome, it is enough to scan a "cross" projected over the top of dome – this way, also the exact position of the dome top is determined, which may be important for the next production steps. The top of dome can be marked with a marking head or directly with a plasma torch, depending on the particular configuration of the machine. Also, if the cutting plan involves just a part of the dome surface, e.g. the spherical top part that is usually quite flat, it is not necessary to scan the whole dome extensively. In case of cutting into the more flat top part the height control during cutting can be based on plasma arc voltage which is a standard function of any MicroStep plasma cutting machine.

All processes and 3D scanning functions are handled by the machine operator or easily accessed via a company network. Additionally, mScan provides an analysis of shape geometry – a comparison of the true and ideal shapes of the scanned object which in itself is a powerful tool for verification of production output in production of 3D objects, e.g. domes.
Thanks to the modular structure of MicroStep machines in terms of machine dimensions, types and locations of cutting zones and configurations of tool stations, a particular machine can be designed according to exact requirements of a customer´s production. A single gantry with a bevel tool station, 3D scanner and marker can be used for cutting of domes as well as flat sheets – an example is the DRM machine for Slawinski GmbH in Germany with a flat-bed cutting of sheets on the area of 14 x 6 m and dome cutting in the range of Ø 500 – 5,500 mm with a dome height up to 1,200 mm.

Maximum precision in dome cutting is made possible by MicroStep's mScan technology. In the process, a laser scanner integrated into the portal determines the 3D surface geometry of the workpiece in advance.

EXTRA: MicroStep mCAM – CAM solution for cutting of 3D parts

Modern industrial factories, which greatly focus on efficiency, automation and computerization of production processes, have been increasingly relying on CAD design software, which allows 3D modelling of parts and construction assemblies. The option of easy and comfortable 3D modelling has naturally also brought requests for CNC machines programming based on these models – 3D CAM software.

MicroStep has been designing and producing complex cutting solutions for almost three decades. In addition to development of machines and their control systems, the company has also been focusing on development of its own software tools for creation of cutting plans: the CAM software package Asper® for cutting of plates, which included also parametric libraries for creation of cutting plans for 3D shapes – pipes, profiles, domes and pipe elbows. Years of experience with 3D cutting of various materials resulted in development of another tool – a 3D CAM software launched under the name mCAM.

mCAM is designed for advanced 3D production with plasma, oxyfuel, waterjet and laser technologies. The program can process 3D models created by common CAD software and offers automatic nesting of parts and automatic generation of CNC programs including visualizations and simulations. A straightforward user interface enables easy, efficient and accurate processing of parts, as well as easy implementation of special technological operations (e.g. marking of text or contours, or drilling). The entire cutting process can be conveniently simulated in 3D, which allows the operator to check details of cutting paths, positioning of pipe supports and to monitor the overall motion control on the contour – its speed, dynamic change of the kerf width and machine movements in particular axes.

mCAM has been developed for easy generation of CNC programs for all types of cutting machines, with multiple options for cutting automation. The program uses boundary representation models in order to recognize 3D models and is able to process 2D and 3D formats commonly used in industrial production:

- 3D CAD models – in STEP, IGES, DSTV, XML and IFC
- 2D shapes wrapped around/projected on parametrized solid
- Models created directly in mCAM using an integrated modeler
- existing CNC code (generated out of MicroStep's SolidSel/PipeSel libraries)

The software enables import of 3D assemblies where each assembly element is recognized as a separate part. Afterwards the parts are sorted according to their shapes, sizes and materials. The entire cutting plan preparation, from loading of the parts to adjustments and nesting consist only of a few easy steps.

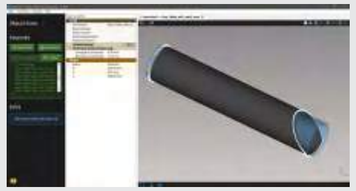
mCAM uses in-depth shape analysis for correct recognition of complex cuts and weld preparations (V-, Y-, X-, K-cuts) that simplifies the subsequent work with parameters and properties of cutting paths, contours and individual parts. Complex features and functionalities (such as automatic detection of cutting paths, dynamic 3D compensation of kerf width according to the used tool, insertion of micro-joints, different lead-in and lead-out shapes and 2D/3D cutting simulation), combined with an intuitive graphical interface, make this program highly efficient and well organized.

A variety of supported part shapes

Shape recognition is based on detection of 3D surface geometry according to known geometrical parameters and properties of various supported shapes. The latest version supports detection of these 3D shapes: flat plates, circular pipes and segments, hollow sections, elliptical, torispherical and semi-elliptical domes, cones, arched, dished, flat and inverted domes, sphere-caps, extruded and bent U- and L-beams and H- and I-beams with parallel and non-parallel flanges.

Simulation and graphical visualization of CNC programs

The software's main output is a CNC code – a cutting program for a MicroStep cutting machine or, with the help of a post-processor, even for third-party machines. The basic CNC code is standardized to DIN/ISO 66025 while also containing special control instructions for various types of rotators and automation tools. mCAM also contains a cutting simulator which enables visual inspection of the generated CNC programs. The simulator can display progress curves of machine and tool movements in great detail, speed and performance controls and dynamic kerf compensation. It shows the workpiece that was defined before the program generation, the cutting tool, all cutting paths and detection points on the surface as well as useful charts, which can help reveal possible unwanted movements.



"Now we prepare optimal products for pressure vessels manufacturers"

Bödenpresswerk Daaden has made a leap in terms of precision, portfolio expansion and production speed. The company benefits from a special CNC cutting machine with mScan technology that can process large-format domes as well as plates

Whether small businesses or large corporations, many rely on products of Bödenpresswerk Daaden GmbH. The company has been manufacturing domes for many years now and is in high demand with companies involved in apparatus, container and plant construction. The experts in dome production at Bödenpresswerk have been using MicroStep technology since 2012. To expand capacities and product range, they decided to invest into a specialized dome cutting machine by 2017.

Red-hot domes are emerging out of the blast furnace, a few steps further the flanging and dishing machines hammer with constant rhythm and trained fingers operate several joysticks at once. Dome production is a complex process that requires skilled workforce and the right technology. After all, different industries have different requirements in terms of shape, surface quality and accuracy of the torispherical, semi-ellipsoidal or flat dished heads they need. Bödenpresswerk Daaden is a renowned company with around 70 employees at its headquarters in Westerwald, Germany. The company, although founded only in 2001, draws on 70 years of tradition in dome production. "We stand out through our flexibility and the know-how of our employees. This allows us to undertake even the most complex projects that involve a wide variety of dome shapes," says Daniela Gerold, Head of Sales at Bödenpresswerk Daaden. The dome producer has customers from many different industrial segments – manufacturers of pressure vessels and machinery, companies from the chemical, food and transport industries as well as architects and artists.
The first technological step to a high-quality dome takes place on a plasma cutting machine. Here a circular blank is cut out of flat sheet – in later processing steps it is going take its dome shape. Since late 2012, Bödenpresswerk's dome pressing plant has been using a MicroStep MG machine for this purpose – equipped with a bevel head to cut material thicknesses between 3 and 30 mm. One of the deciding factors in that purchase was a recommendation from a long-term customer of MicroStep – the German vehicle manufacturer Feldbinder Spezialfahrzeugwerke GmbH – who is using the domes to produce tank ends for silo and liquid tanks of their transport vehicles.

Meeting growing demands with innovative technologies

In 2017, a new MicroStep plasma cutting machine of the DRM series was added to Bödenpresswerk's machine park. Equipped with a 3D plasma rotator with torch tilt up to 120° and a work area for placing domes up to 5.5 m in diameter and 1.5 m height, its main focus is dome processing. "The requirements for processing of domes have been growing steadily over the past 20 years and therefore it is very important for us to constantly invest in latest, state-of-the-art technologies," says Daniela Gerold. The dome and plate cutting machine is capable of

cutting complex weld edges such as X cuts in the whole surface area of various dome types and shapes, to trim domes with bevels and cut precise openings in different parts of domes. Thanks to MicroStep's unique mScan technology the cuts require little to no further processing before shipping to Bödenpresswerk's customers.
"The 3D plasma cutting system has optimal capabilities for cutting of socket holes in all dome types. Furthermore, the built-in scanning technology provides us with a quality check: a comparison of the modeled and real shapes of each dome, which enables us to work even more quickly and precisely," explains Sebastian Buchner, mechanical engineer who is also responsible for production planning. The machine allows to cut dome into segments, trim the bottom, make cut-outs, cut-outs with micro-joints and also to mark the dome surface. The tolerances of ±1 mm required in dome cutting are problems for the DRM. "Thanks to this we can provide our customers with an optimally prepared product," says Mr. Buchner.

"Competent partner at our side"

The impression created by the two machines was good indeed. So much so that there was no hesitation when Bödenpresswerk Daaden considered an upgrade of their cutting machinery – they decided to replace the original MG machine with a combined plate and dome cutting machine of the CombiCut series. The 2021 delivered new

machine gives them the ability to cut 7.5 x 4 m plates along with domes of up to Ø 3,000 mm in two separate work zones.
In addition to higher production capacity, processing speed and portfolio expansion, the arrangement with two machines has other advantages. Multiple cutting machines allow the separation of mild steel and stainless steel cutting required by pharmaceutical and chemical industries. Also, dividing the production between two halls has minimized issues connected with material handling. One partner, two machines, many advantages!
"With MicroStep, we have a competent partner at our side. Regular information exchange as well as trainings and reliable service are the corner stones of our good cooperation," emphasizes Daniela Gerold.

Bödenpresswerk Daaden
Video presentation:

www.microstep.eu/video

Sebastian Buchner
Mechanical Engineer/ Production Planning
Bödenpresswerk Daaden GmbH

„The 3D plasma cutting system has optimal capabilities for cutting of socket holes in all dome types. Furthermore, the built-in scanning technology provides us with a comparison of the modeled and real shapes of each dome, which enables us to work even more quickly and precisely. Thanks to this we can provide our customers with an optimally prepared product."

3D solutions for steel constructions

Versatile options for beam and pipe processing: Automatic cutting machines for structural steel jobs

The calibration system ACTG® enables durable high-precision results – also with the pantograph. This specialized 3D cutting head with tilting ability of 120° moves around the profile both in the longitudinal and transverse directions.

Apart from standard flat-bed machines, MicroStep offers an exceptional variety of equipment for processing of 3D rotary objects and structural steel sections of various shapes. The rotary objects include differently sized circular, square and rectangular hollow sections (diameters of circular sections reach from Ø 30 mm up to Ø 2,000 mm), conical pipes, torispherical or elliptical domes and elbows.

Standard configuration of a MicroStep machine in sheet and pipe cutting execution consists of a cutting table for sheets and an extracted channel for pipe positioning that is placed along the longitudinal side of table.

Pipes are clamped in a rotary pipe cutting device located at one end of the channel. The cutting process involves a combination of movements: the gantry with tool stations – straight or bevel – and the pipe cutting device are synchronized for a precise positioning of the pipe towards the cutting tool. In addition, special adapters for clamping of polygonal profiles or elbows can be attached to pipe cutting device. For cutting of domes, a dome cutting area can be located behind or in front of the cutting table. A single cutting tool is used to process all different shapes of material.

For applications in the structural steel industry MicroStep developed a product line of specialized machines for cutting of structural steel sections as well as single-purpose machines for automated cutting and drilling of flanged parts. These machines can be supplied in various executions depending on types and sizes of processed material or the requirements for automation of material input and/or part output, and alternatively connected to a production line in the customer´s facility.

For cutting of hollow structures of circular and rectangular cross-sections MicroStep supplies the cutting machines PipeCut and CPCut.

Both systems are of a modular execution, which means that they are configured for particular requirements of customer´s production.

PipeCut machines can have a working length of 3 m, 6 m or 12 m and can process pipes with diameter ranges Ø 50 mm to Ø 800 mm. The maximum wall thickness is 50 mm for plasma cutting and up to 100 mm for oxyfuel. CPCut machines can process also large-sized pipes with diameters of up to Ø 2,000 mm.

MicroStep

Alexander Varga, Ph.D.
Head of R&D
MicroStep

"Our portfolio includes multi-functional systems that can process sheet metal, tubes and beams as well as single pipe or profile processing solutions."

For cutting of open profile sections, such as I, H, U or L profiles, MicroStep introduced a concept with a 3D kinematic system that is positioning the cutting torch above the surface of a steady profile – this machine line is supplied under the name ProfileCut. During the cutting process, the cut profile is motionless while a specialized 3D cutting head with tilting ability of 120° moves around the profile both in the longitudinal and transverse directions.

Possibility to equipe ProfileCut machines with cutting zones for hollow profiles or sheet metal

Furthermore, the abilities of ProfileCut can be enhanced by adding a drilling/tapping/countersinking tool station with automatic tool exchange for plate drilling up to Ø 40 mm or by various marking tool stations. The precision of cutting and positioning of the tool above the actual profile is achieved by an advanced system of 3D scanning of profile shape with laser line scanner, followed by automatic adjustment of cutting program as well as adjustment of machine movements according to the true shape of material.

In addition to cutting of open profiles, ProfileCut machines can be equipped also with other cutting zones, e.g. for processing of hollow profiles (cutting by means of a pipe positioner like on a PipeCut machine) or a cutting table for sheet cutting like on a standard flat-bed machine – all by using the same gantry and tool stations. This concept makes the ProfileCut one of the most versatile cutting solutions for steel constructions on the market.
For requirements of automation of the cutting process with automatic loading and unloading of material – no matter if sheets, hollow sections or open profiles – MicroStep offers enhanced versions of its machines with input and output conveyors in which the material is inserted into the working area on a roller track by special gripper arms.

Such automated lines equipped with automatic measurement of the thickness and dimensions of material offer further possibilities of automation in interconnection with information systems or production management applications like MicroStep´s MPM.

MicroStep has developed a variety of solutions for high-precision 3D processing of tubes, profiles and beams – including fully automated material handling.

Market leader trusts MicroStep again

Pipe cutting solutions for the Chinese Gree Group: the world's largest manufacturer of air conditioning solutions

When it comes to air-conditioning, Gree Electric Appliances Inc. is the world's number one. In their production facilities, the company relies on machinery from MicroStep.

The HQ of Gree is located in the vibrant city of Zhuhai; here the company develops and manufactures air conditioning units with a turnover of more than 13 billion euros per year. Air conditioning solutions from Gree find their application in many housing and industrial facilities worldwide, from single family homes up to large prestigious projects such as the site of the final match of the 2010 Football World Cup, the National Stadium in South Africa (Soccer City) in Johannesburg. Projects like these require a high degree of precision when manufacturing components. Big construction projects in particular require very long pipes to be cut with utmost accuracy.

In 2016, Gree went on to look for a new cutting solution that would suit their needs – a combined system for weld preparation on pipes and smaller domes. The decision fell on a MicroStep PipeCut machine for processing of pipes with a length up to 12 meters and a maximum diameter of 610 mm. The machine is equipped with MicroStep's industry-proven plasma bevel tool station with auto-calibration that enables easy and precise bevel cutting and trimming of pipes up to 45° with edge preparation for welding. Further in accordance with the production requirements, the machine design has been tailored to include a 1,400 x 1,400 mm cutting table for 3D processing of dished ends – all programmable with MicroStep's 3D CAM software mCAM.
Thanks to good experience with the first solution, Gree purchased further two similiar PipeCut machines in the course of 2019 and 2020 for their Changsha and Hefei production bases.

Top left + right: Gree's three combined pipe & dome cutting machines from the PipeCut series allow to cut pipes up to Ø 610 mm and a length of 12 m as well as domes up to Ø 1,200 mm. **Bottom left:** Gree Electric Appliances Inc. participated on prestigious projects such as the National Stadium (Soccer City) in South Africa's Johannesburg.

Ariel KBK4 two-stage compressor unit from Euro Gas Systems. Production of such equipment fully utilizes the multiple functions of supplied DRM machine

DRM gantry in EGS equipped with three tool stations. The machine has three work zones: cutting of beams (left), cutting of sheets and domes (front right) and cutting of pipes (rear right)

Oxyfuel bevel cutting of sheet metal - preparation of „top Y" shaped weld surface

Multiplying the productivity

Euro Gas Systems, a modern European manufacturer of gas compression equipment, invested in a multi-functional DRM machine for cutting sheets, pipes, beams and domes

Located in the heart of Romania's Transylvanian Basin, the city of Chirileu is home to Euro Gas Systems (EGS), a manufacturer of gas compressor packages. EGS is an ISO 9001 certified packager and official packager/distributor for Ariel, 'Platinum Solution Provider' for Waukesha and OEM for Caterpillar and other major equipment brands, providing world-class compression to the European, Middle Eastern, Africa, Asia and CIS markets. With a background of more than 30 years of experience in the field, the company operates three production plants with a total area over 9,000 m² and a 1,300 m² office space. Here, a comprehensive machine park comes into action including CNC cutting, welding, drilling and rolling machines, a press brake, vertical and horizontal machining centers as well as own dyeing and sandblasting chambers.

Besides packaging of reciprocating gas compressors EGS's product portfolio also covers gas-to-power solutions for the oil and gas industry, air-cooled heat exchangers (ACHE) and pressure vessels with PED and ASME certifications. Having decades of experience, broad in-house resources, and world-class facilities, the products offered by EGS are tailor made with a wide flexibility of integrating also custom specs. The focus on building up the in-house engineering capabilities and services has also been a driving force for EGS in new machinery acquisitions.

„One of our company's goals is to increase efficiency in all the production processes so that we can build better quality product, in shorter time and at better cost" says Roger Wachter, General Manager for EGS, who took the decision to invest into in a multi-functional CNC cutting machine in the course of 2020. The choice fell on MicroStep, as the company was able to offer a machine for processing all required types of semi-products and also proved experience with similar multi-functional cutting solutions. „This investment checked all of the 3 objectives, making it an easy decision, looking also at the potential ROI," states Wachter.

Universal machine for EGS

According to EGS' technical requirements, a universal and robust CNC cutting center MicroStep DRM has been tailored. The machine consists of three separate zones: a sheet and dome cutting zone, a pipe / closed profile cutting zone and a beam cutting zone 2. Above each of the zones, a heavy-duty gantry operates equipped with three tool stations: a 3D plasma rotator with tilting up to 120°, an oxyfuel rotator with tilting up to 60° and a 3D laser scanner. The machine combines plasma and oxyfuel bevel cutting with intelligent scanning functions. „With the laser-based scanner, the machine automatically adjusts its cutting path to account for any variation of product shapes due to mill tolerances," explains Wachter.

„Final cuts are remarkable with clean bevels that require limited further preparation prior to fit up and welding."

A typical example of the benefits that such a machine brings to producers like EGS is one of the typical products: a two-stage compressor unit Ariel KBK4 1. Its production requires precise cutting with welding preparation on sheets, pipes, domes as well as various types of open profiles.

Bevel cutting of sheets and domes with plasma and oxyfuel

The sheet and dome cutting zone of the machine consists of a cutting table with work area 6 x 2.5 m that enables plasma cutting of sheets in a thickness range 2 – 80 mm and oxyfuel cutting between 10 – 150 mm 3. It also allows to place a dome on the table up to a diameter Ø 2,000 mm and height 600 mm which can be cut with both plasma and oxyfuel 4. Thanks to the 5-axis pantographic bevel head with Hypertherm's HPR400xD (400A) plasma technology, the machine can cut contours into the entire dome surface and also trim dome edges for weld preparation. After cutting, the domes are welded onto pipes to produce pressure vessels, for example compressor expansion tanks.
Since real domes usually have deviations from the underlying (ideal) shapes of their 3D models used for CAM programming, the key to precise machining is to identify the true shape and dimensions of each dome a machine is going to cut. For this purpose, MicroStep has developed a unique 3D laser scanning process involving point cloud mapping (technology MicroStep mScan) which allows to measure the true shape of a dome and use this measurement for subsequent adjustment of the generated cutting program to follow dome's surface precisely. To enable this, the scanner is placed in a tiltable rotary holder on a separate tool station with a Z stroke as long as 1.5 m. Besides domes, it is used also for scanning pipes, profiles and beams.

Roger Wachter
General Manager
Euro Gas Systems

EGS Euro Gas Systems

„On the pressure vessels nozzle cuts we managed to reduce the actual layout/cutting/weld preparation time by at least 70%. Similar results are seen in cutting I beams."

Cutting of pipes up Ø 2,000 mm

Zone for cutting pipes and hollow sections is located behind the cutting table. It enables bevel cutting of pipes in a relatively big span of diameters: Ø 100 - 2,000 mm. Due to the large max. diameter, the whole pipe positioner and supporting rollers assembly need to be embedded 1.25 m below floor level.

EGS manufacture their pipes with a diameter of over Ø 900 mm by rolling them from sheets. Pipes produced this way tend to have slight deviations in roundness, which could result in an inaccurate position of the cut contours caused by the rotary positioning of pipe around its longitudinal axis. In any case, the machine can ensure accurate cutting results by scanning the pipes with the laser scanner and subsequently compensating the measured deviations. In addition to plasma, the machine also enables bevel cutting of pipes with oxyfuel.

Beam cutting and deviation compensation

Along the cutting table is reserved an area for cutting beams up to a length of 12 m and web width 1,000 mm. Beams are placed onto cantilever supports with spikes, under which a suction channel is located. The machine can process a wide range of beam types – U, L, IPE and HEA. The beams are cut by moving the gantry with cutting tool along the statically placed profile, while the 5-axis rotary head with a torch tilt of up to 120° covers the profile surface from three sides and thus ensures not only cutting of holes, but also dividing profiles and cutting contours in its cross section with weld preparation. Real beams can deviate from standard dimensions and from certain lengths are prone to twisting around longitudinal axis. To achieve the required accuracy and avoid deviations, each beam is scanned in the area of the cut before actual cutting 6.

To facilitate the weld preparation of H beams, which are used in EGS for the production of platforms for compressor units, MicroStep has developed additional custom macros for its 3D CAM software mCAM. Thanks to the intelligent preparation of cutting plans, scanning and comprehensive control of the movement of the cutting head, it is possible to achieve high accuracy with minimal need for further surface processing before welding 7.

mCAM also significantly contributes to the overall efficiency of production preparation at EGS. Not only is it importing and processing complex 3D models of parts and assemblies at once and breaking them down automatically to cuttable shapes, it also automatically loads technological parameters from the connected cutting machine to generate dedicated cutting plans. It is especially convenient for processing of HEA and IPE beams that can have different thicknesses of webs and flanges and thus require adjustment of cutting speed on transitions. Thanks to communication with the control system, mCAM is able to generate cutting plan for a particular semi-product automatically, including cutting speed change when transitioning between different material thicknesses in one beam.

„The machine allows our team to streamline production time with increased accuracy throughout all stages of the manufacturing process," assesses Roger Wachter. „On the pressure vessels nozzle cuts we managed to reduce the actual layout/cutting/weld preparation time by at least 70%. Similar results are seen in cutting I beams for manufacturing of base skids and sub skids (compressor/driver modules). The CAD/CAM software interface between our 3D design department and the cutting center eliminates potential mistakes by removing the need for human interaction between the processes," adds Wachter.

Bevel cutting of a smaller dome with plasma (left) and oxyfuel (right). The machine can cut domes up to a diameter of Ø 2,000 mm and a height of 600 mm.

Plasma pipe cutting. The large positioner enables cutting of pipes up to Ø 2,000 mm, length 6 m and weight 7 tons.

Scanning and cutting of U beam

Top: Screenshot from the MicroStep iMSNC control system with loaded cutting program for cutting the web of H beam (output from the 3D CAM software mCAM); **Bottom:** Final cut part.

Fully automated MicroStep fiber laser line: a 4 x 2 m MSF Pro bevel cutting machine with 8 kW beam shaping fiber laser, a hydraulic shuttle table and a 10-storey storage tower with automatic loading/unloading. The line can be operated in auto-mode by MicroStep's CyberFab Manager: based on the task list, the machine calls for the corresponding material from the tower and after the cutting is finished, requests the loader to unload the cut parts. The system constantly monitors its 8 loading and 2 unloading cassettes and in case the unloading positions in the tower are full, it asks the operator to take the parts out. Place of installation: France.

The fiber laser experience

MSF product line: versatile, multifunctional, automated

MicroStep's modular fiber laser product line allows creation of customized systems that range from simple machines to complex cutting centers with different work area sizes, technologies and automation options. Equipped with state-of-the-art laser sources and cutting heads, efficient fume extraction and safety cabins, MSF machines are delivered as turnkey solutions with a variety of functions that meet the ever growing requirements of our end users.

First in the line, **MSF Compact**, is a plug-and-produce solution for smaller workshops offered in three standard sizes with work areas of 1 x 2 m, 1.25 x 2.5 m and 1.5 x 3 m. Equipped with laser sources up to 8 kW, the machine is an ideal solution for accurate and reliable 2D cutting up to 15 mm thick plates when a small machine footprint is required. MSF Compact has a single cutting grate that is pulled out of the cabin to the front.

To save valuable production time by allowing simultaneous cutting and loading/unloading, machines with shuttle tables are the setup to go. The basic version, **MSF Cut**, is dedicated to straight cutting of plates with a single cutting head. MSF Cut is delievered in three sizes – 3 x 1.5 m, 4 x 2 m and 6 x 2 m.

The multifunctional MSF Pro series

When looking beyond straight-forward laser cutting, the high-precision all-rounder **MSF Pro** offers true multifunctionality: bevel cutting, marking, drilling and a handful of automation options. With shuttle tables up to 16 x 3 m ❷, the series provides exceptional metal processing capabilities such as chamfering of long parts with variable bevels, inkjet marking or tapping.

MSF Pro machines allow for a combination of multiple cutting heads and also a combination of different technologies in one gantry ❻ that can be switched automatically within a single cutting plan. To accentuate efficiency, the machines come with automatic laser heads and gas consoles, automatic nozzle cleaning, height control calibration, as well as an option of automatic nozzle change ❹.

MSF Max series

Originally launched for large-scale cutting tasks, the **MSF Max** series can be delivered with overall table dimensions as large as 50 x 6 m. It is dedicated for custom applications, e.g. in the shipbuilding sector, or simply when some particularly wide work areas are needed. MSF Max can be equipped with one or two bevel heads and a drilling tool station up to Ø 30 mm.

The machine offers several setups of cutting tables and safety cabins: a movable, and optionally even a motorically retractable cabin ❺ that completely covers the work area, or a smaller light-weight cabin that encapsulates just the gantry with cutting heads. It can have a shuttle table, a shuttle loop system with rotating pallets or a standard fume extraction table with a vibration conveyor for waste disposal.

Laser bevel cutting: direct and additional beveling

MSF machines provide beveling capabilities with up to 45° angles that range from small contours to long variable bevels. Whether it is direct beveling or complex beveled edges achieved with ABP® process – with dozens of laser heads installed over the last few years, MicroStep has established laser bevel cutting as an efficient, uncomplicated and reliable process that aims to be commonly used for weld preparation. All laser bevel heads are calibrated via MicroStep's industry-leading auto-calibration system ACTG®.

Pipes and profiles

Besides flat sheets, MSF Pro machines can be combined with equipment for cutting pipes up to Ø 200 mm, Ø 300 mm (or even Ø 500 mm) and hollow sections up to 280 x 280 mm. The pipe cutting area is placed inside the cabin next to the cutting table. Pipe handling is ensured through a sliding side panel of the safety cabin ❸.

Cutting of pipes and profiles up to Ø 200 mm can be also fully automatic, with a transversal loading conveyor on the input, automatic feeding of pipes into the cutting area, and two transversal conveyors on the output for small and big parts. Both manual and automatic pipe cutting functions are available also as standalone cutting machines – the **MSF Pipe** series ❼.

Large-scale fiber laser bevel machine MSF Pro with work area 16 x 3 m and a 15 kW laser source, installed at a Dutch customer.

Combined MSF Pro machine for bevel cutting of plates up to 6 x 2 m and pipes up to 6 m length and Ø 300 mm diameter installed in Germany. Pipes and hollow sections are loaded manually from the side through the sliding side panels. The machine has a 6 kW laser source with beam shaping technology.

Material handling automation

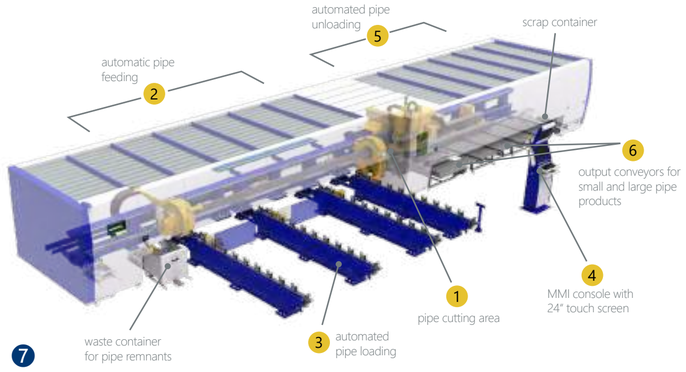
Automating the handling of material is a logical requirement for many laser cutting applications. With **MSLoad**, **MSTower** ❶, **MSLoop** and **MSSort**, MicroStep offers a full suite of material loading, unloading, sorting and tower storage options (see also p. 12, 13 and EXTRA). All MicroStep laser automation solutions have a fair degree of customization with respect to customers' workflow and can be integrated with smart factory solutions.

EXTRA: Laser automation with three work positions

Unloading area of the middle pallet with MSLoad system, with a stockpile of unloaded orders in the front.

The modular concept of laser cutting machinery that has the basic automation element – a pallet changer – already built-in by default, naturally encourages further automation enhancement. An example of such customization is a MSF Pro & MSLoad setup with an extended shuttle table that has three interchangeable pallets, delivered to an Italian steel service center. Having an extra position with the size of work area allows to separate the loading and unloading process and achieve higher throughput: all three operations – loading, cutting and unloading – can run simultaneously.
Moreover, the rather larger work area of this machine – 6 x 3 m – is designed for placing up to four 3 x 1.5 m sheets on each pallet which means that the workplace can be fully loaded with twelve 3 x 1.5 m sheets that can be processed fully automatically. An option of deactivating the fork unloader gives the customer a possibility to run the system in a loop – e.g. run laser marking on all three grates automatically overnight and during the day shift proceed with cutting.

Simultaneous cutting, loading and unloading monitored from the operator console.



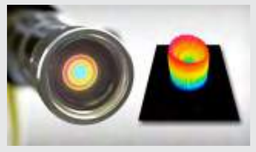
Automated pipe cutting machine MSF Pipe designed for 2D or 3D cutting of round pipes up to 6 m length and diameter Ø 200 mm as well as for tubes of rectangular and other cross-sections. The machine features a laser scanner that is used to determine the real shape of pipes to be cut to ensure accurate cutting results.

Top left: Automatic nozzle changer is important equipment for automation.

Top right: 14 m long multifunctional MSF Pro machine with laser beveling, additional beveling and inkjet marking features.

Left: MSF Max with mobile retractable cabin provides great flexibility of work area size.

Optimal cutting results thanks to beam shaping



Beam shaping technology makes it possible to change and optimize shape, size and power density concentration of a fiber laser beam – in other words, to use the optimal fiber mode for your cutting task. It can provide a beam with a very small diameter, with a heat profile that is peaking in the center of the beam – but also a wide "donut"-shaped beam for achieving wider kerf.
This approach allows to reach highest speeds and performance on thin materials while cutting thicker materials with high quality, minimum dross and a 100% part drop-off. Integrated in all MicroStep fiber laser machines.

MSF Max a success at the traditional French cruise ship builder

MicroStep´s laser flagship with bevel cutting solution debuted with style in Chantiers de l'Atlantique

Located on the coast of the Atlantic, Chantiers de l'Atlantique shipyard has a long tradition in cruise ship construction, many of them being the largest at their time. In recent years the company expanded its focus also to the offshore renewable energy constructions.

Up to 150 years ago, Saint-Nazaire was just a simple harbor village on shore of the Atlantic Ocean. Its strategic location near the mouth of the river Loire has proven vital with the arrival of the industrial revolution. In 1861 John Scott from the Scottish shipyard in Greenock has been appointed to establish a new shipyard and to supervise the construction of the very first ship Impératrice Eugénie, which was delivered only three years later in 1864.
Since then, shipyards in Saint-Nazaire have been undertaking colossal projects that often require the latest achievements of science in order to be feasible. With this context it is no surprise that, over the years, this small French town has become the birthplace of some of the largest ships of their times. Among them one of the largest and most innovative cruise ships ever built – Wonder of the Seas – which debuted in the Carribean just this spring.
Today the shipyards have more than 2,700 employees and more than 500 subcontractors bringing another 5,000 workers on the site every day.
Working in a shipyard can be a very demanding and exhausting job, even for a soulless machine without human needs and cravings. If you are building the world's largest cruise ship you will most likely need big parts, which need to be cut out with great accuracy, and you have to cut a whole lot of them. "We cut about 1,600 meters of material every day," says Project Manager Silvère Destrem.
After some consideration, Chantiers de l'Atlantique opted to invest into a large-scale fiber laser machine MSF Max. It is a 50 m long machine with two 21 m x 3.5 m cutting zones. The work area consists of suction tables sunk into the ground of the production hall to allow easy access onto the grates during loading and unloading. The suction table is divided into electronically controlled suction zones that ensure high suction efficiency and allow customized setting of zone opening times.

"The idea was to improve our workshop with a modern and efficient machine"

The older CNC laser machine at the shipyard was a CO_2 type. Even though CO_2 lasers have certain advantages, such as the ability to cut different materials and deliver smoother cut surface especially in bigger thicknesses, they are less efficient and require regular maintenance of the laser beam path, with the setup and alignment of the mirrors in the beam path limiting the maximum length of the machine setup. For larger-scale applications, the CO_2 laser source needs to travel with the gantry while maintaining beam path geometry at a required precision. That brings several design and production challenges – the more complicated the system, the more demanding it is in terms of maintenance and the higher is the probability of downtimes. "The idea was to improve our workshop with a modern and efficient machine," explains Mr. Destrem. Fiber laser technology eliminates several of CO_2's setbacks. Its efficiency is much higher and the optical fiber that guides the laser beam is not limited by length and requires almost no maintenance. "An easy-to-use-and-maintain concept was an important criterion in our decision process."
The machine is equipped with a 3D bevel cutting head with an 8 kW laser source that allows Chantiers de l'Atlantique to make weld edge preparation on parts up to 20 meters long and up to 16 mm thick with bevel angles ranging up to 45°. The system is easy to use and maintain: accuracy and long-term stability of the machine's geometry that is essential for accurate bevel cutting is ensured by MicroStep´s patented auto-calibration system ACTG®. All the operator needs to do is to swap the cutting nozzle with a calibration jig and initiate the automatic calibration process – if any inaccuracies are detected, the machine will automatically adjust its movements to compensate for the measured mechanical deviations.

The new system has proven itself in production

Because of the large machine size in this particular case, the ACTG calibration station is placed in a combined technological station that is mounted directly on the gantry and is ejected during the calibration process. The station also contains other equipment – a pad for calibration of the capacitive height sensor inside the laser head, and a nozzle cleaning system consisting of a camera and a wiping brush. In addition, high absolute accuracy of the machine (approx. 0.2 mm at room temperature) has been ensured by a positioning tolerance compensation feature, based on precise initial machine measurement with a laser tracker device.
After three years in production the feelings are positive. "The quality of the cut pieces is better than with our old machine. The efficiency has increased. We have the opportunity to make the production evolve towards new products," concludes Mr. Destrem.
In addition to MSF Max, in 2020 the shipyard invested in two panel lines from Finnish supplier for welding and production automation Pemamek Oy. Each line includes a 20.5 m wide MicroStep gantry equipped with plasma cutting, grinding and marking technologies. Besides cutting and marking of parts, the gantries provide primer removal and marking of synchronization lines for the subsequent robot welding process.

In 2020, the shipyard invested in two panel processing lines which include two 20.5 m wide MicroStep gantries for bevel cutting, primer removal and marking of large-scale panels.

The machine is equipped with a bevel cutting head with 8 kW laser source that allows Chantiers de l'Atlantique to make weld edge preparation on parts up to 20 m long with thicknesses up to 16 mm and bevel angles up to 45°.

MSF Max
Video presentation:

www.microstep.eu/video

CHANTIERS DE L'ATLANTIQUE

Silvère Destrem
Project Manager
Chantiers de l'Atlantique

"The quality of the cut pieces is better than with our old machine. The efficiency has increased. We have the opportunity to make the production evolve to new products."

Above: Chantiers de l'Atlantique opted to invest into a large-scale fiber laser cutter MSF Max. It is a 50 m long machine with two 21,000 x 3,500 mm cutting zones.

Left: Accuracy and long-term stability of the machine is ensured by MicroStep's patented auto-calibration system (ACTG®). The ACTG station has been integrated together with a calibration pad for the capacitive height sensor and a nozzle cleaning system in a combined technological station that is placed under the gantry and ejected in case of calibration.

Below: 2022's Wonder of the Seas, CDA's most innovative cruise ship yet offers an unparalleled combination of entertainment, dining and nightlife.

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Flexibility for the requirements of today and tomorrow

Sealpac GmbH, a global manufacturer of automated systems for food packaging, invests in a multifunctional fiber laser machine for 3D processing of sheets, pipes and profiles including material handling systems with a high degree of automation

The German company Sealpac GmbH is one of world's leading manufacturers of systems for automated packaging of food. In order to expand production capacities and increase flexibility, this innovative medium-sized company invested in MicroStep's multi-functional 3D fiber laser cutting system MSF Pro. The wide range of integrated technologies and the high degree of automation played a major role in this investment decision. The machine allows to process sheets, pipes and profiles with bevel cuts and markings while automated material feeding ensures high accuracy and production efficiency. In case of certain components, the customer experienced up to 4 times faster production times already in the first weeks after installation.

During the daily walk to the supermarket or to the butcher's shop, one very often comes into contact, at least indirectly, with the precision machines of Sealpac GmbH, a company based in Lower Saxony, Germany. The globally active high-tech company from Oldenburg develops and manufactures systems for food packaging. Sealpac's employees aspire to set new standards in automated food production and to always offer the best possible solution. For Sealpack this means not only do deliver high performance and flexibility, but also a proven and reliable quality with maximum efficiency. Summarized: innovative spirit and precise work are the essential part of the daily job.

The company started writing its history 33 years ago in a small garage. Today, 250 employees work at the Oldenburg site alone, and the products are available in more than 60 countries worldwide. Industry giants such as Edeka, Wiesenhof or the Tönnies group rely on Sealpac systems – but also small butcher shops, bakeries and food processors. In October 2018, Sealpac's sustainable and material-friendly FlatSkin® system received the ECMA Award (European Carton Makers Association) in the category "Save the Planet".

Trained and autonomous personnel at the equipment, practical experience in management

"In addition to the well-trained staff, one of our strengths is the human approach within the company. Everyone knows each other by first name, the official routes are very short, the hierarchies very flat," says Samir Ramadan. He works in the production planning department at Sealpac and, the production manager Sascha Westphal alike, started his career as a machine operator. "Our managers all come from the field. That helps with all challenges. Our people do the programming themselves; we have well-trained and autonomous personnel," says Ramadan. And this is also necessary, because often the systems have to be customized for clients' needs – this involves maintaining accuracies within thousandths of a millimeter. The machine park is set up accordingly, investments in modern systems are made on an ongoing basis, and purchases must also meet long-term production needs.

In 2017, the managing director of Jörg von Seggern, Sascha Westphal, and Samir Ramadan set out to find a suitable laser cutting solution for cutting their pipes and profiles. The goal was to release milling machines and other technologies for other tasks and to reduce the dependence on job contractors. "We aimed to create free capacities with this new acquisition", states Samir Ramadan in retrospect. The decision makers took their time in analyzing the available laser cutting systems on the market. "The basic idea was a dedicated pipe and profile laser cutter. We looked at many of them and the idea was born to include the processing of flat material. But we primarily process pipes and profiles," says Ramadan. After weighing up all the parameters and comparing the offered laser systems, the company decided to favor MicroStep's multi-functional solution with a high degree of automation. The reason: a wide range of technology options and the resulting flexibility for the development and manufacture of the current and future product portfolio.

Significantly faster and more flexible with the new solution

The multi-functional MSF Pro laser workplace was put into operation in September 2019. The CNC system with a laser bevel head and scanning technology for 3D processing of sheets, pipes and profiles including automated material handling of all material types is used exclusively for the in-house production of Sealpac GmbH.

The automated CNC fiber laser offers options for processing of sheets with a working area of 6,000 x 2,000 mm. Additionally, pipes up to 200 mm diameter and profiles up to 140 mm edge length with 6 m length can be automatically loaded into the cabin, clamped, positioned, cut and unloaded. "We have cutting jobs, such as processing of bone profiles, for example, where we now need 8 minutes instead of 35," says Samir Ramadan, who is also responsible for operating the machine. Sealpac uses its laser exclusively to process stainless steel, including single parts, but also for series of parts up to batch size 400. Sheets are processed with up to 10 mm sheet thickness standardly, and pipes and profiles with a wall thickness from 2 to 6 mm.

Samir Ramadan
Production Planning
Sealpac GmbH

„We have cutting jobs, for example the processing of bone profiles, where we need 8 minutes now instead of 35."

Sealpac
Video presentation:

www.microstep.eu/video

"This is exactly the system we need, the precision is very impressive!"

MSF Compact: lower costs and more productivity for Metallbau Pfister

Too many bought-in expensive laser parts, a plasma cutting system that does not sufficiently cover the tasks at hand: the versatile Metallbau Pfister AG was looking for a compact laser cutting system that requires little space and promises high precision and speed. After good experiences with MicroStep, they found it in the MSF Compact. „This is the perfect machine for our space conditions," says Managing Director Curdin Pfister.

The Swiss Engadine: Metallbau Pfister AG is located just a few minutes' drive from the luxurious vacation resort of St. Moritz. A wide range of customers from various industries rely on the company's expertise and quality. „We are very flexible and broadly based. With us, customers often only come to the office with an idea. We try to fulfill the wishes of our customers with our expertise," says Managing Director Curdin Pfister. The range of services is extensive – the projects, buildings and products in the fields of metal construction and locksmith work are correspondingly diverse. The AG, which has more than 30 employees, also offers engineering services and wrought-iron work.

Powerful fiber laser currently in use ten hours a day

The compact 2D system MSF Compact with a working area of 3,000 x 1,500 mm has been in operation since the end of 2019 and is in use ten hours a day. „The laser system runs like clockwork, which is very, very gratifying. This is the perfect machine for our space conditions," says Curdin Pfister. Thanks to the powerful 6 kW fiber laser source, sheets up to 20 mm can be cut.

No more buying expensive laser parts

For a new acquisition of the laser cutting machine it was decided, after having examined the expenditures for the laser contract cutter. These increased constantly. The in-house plasma cutting system – also from MicroStep – could no longer meet the changing and growing requirements. „We were satisfied, it worked out well. But it was no longer suitable for our requirements. We wanted a new machine that would meet our current requirements in terms of precision and speed".

After Pfister had had good experiences with MicroStep, Curdin and his father Urs took a close look at the subject of fiber lasers. Because of space problems, the MSF Compact was the best solution. It is now hardly necessary to purchase any additional parts. For Curdin and his father Urs Pfister, the purchase paid off immediately. „This is exactly the equipment we need here in the company for our work. It is small and compact and fits exactly into our limited space. The precision is very impressive," says Urs Pfister, who is also a Managing Director.

Machines | The right machine for every cutting task

Plasma Oxyfuel

MG

MG is MicroStep's top-class CNC cutting machine suitable for long-term industrial use while meeting highest requirements on precision, performance and ease of operation. MG machines are suitable for a variety of applications such as bevel cutting with plasma and oxyfuel, additional beveling process (ABP), pipe, profile and dome cutting, drilling and marking.

Plates | Pipes & profile | Domes | 2D cutting | Bevel cutting | Drilling Tapping Countersinking | Marking | Scanning

Plasma Oxyfuel Drilling

DRM

DRM is a heavy-duty CNC cutting machine designed for a wide range of dome, plate and pipe cutting applications. Its robust gantry allows a vibration-free operation of heavy equipment such as automatic oxyfuel triple torches or a 120° rotator with Z-axis stroke 1,500 mm for cutting of dished ends. DRM can be delivered also as a high-performance drilling machine with special drilling table.

Plates | Pipes & profile | Dome | Beams | 2D cutting | Bevel cutting | Drilling Tapping Countersinking | Marking | Scanning

Plasma Oxyfuel Milling

DRM Max

DRM Max machine has a dedicated drilling/milling area with an independent sub-gantry and two powerful retainers that make milling up to a length 750 mm along the X axis possible. The robust design enables drilling up to Ø 70 mm and a variety of milling jobs such as large hole milling, face milling, pocket & slot milling, chamfer milling, thread milling or counter boring.

Plates | Pipes & profile | Domes | 2D cutting | Bevel cutting | Drilling Tapping Countersinking | Milling | Marking | Scanning

Plasma Oxyfuel

MasterCut

MasterCut is a versatile high-precision CNC cutting machine which can be applied throughout the industry reaching from small workshops to big factories. The standard version with rails in the X direction can be enhanced to a variety of high-precision plasma cutting applications including pipe, profile or elbow cutting and marking.

Plates | Pipes & profile | 2D cutting | Bevel cutting | Marking | Scanning

Plasma Oxyfuel

MasterCut Compact

MasterCut Compact is a dynamic, high-precision CNC cutting machine suitable for a variety of plasma and oxyfuel cutting jobs. Thanks to its sophisticated design it smoothly delivers latest features of plasma technology for a decent price – true contours, small holes, sharp corners. An optional bevel cutting tool station allows to perform a great portion of common bevel cutting jobs.

Plates | 2D cutting | Bevel cutting | Marking

Plasma Oxyfuel

ProfileCut

ProfileCut is a machine dedicated for production of steel structures. Besides optional pipe and plate cutting zones, ProfileCut's main cutting area is dedicated to processing of structural beams such as I, H, U or L. To enable precise division as well as cut-outs in required spots on the beam, the machine is equipped with a laser scanner for measuring of the true shapes of beams.

Beams | Plates | Pipes & profile | 2D cutting | Bevel cutting | Drilling Tapping Countersinking | Marking | Scanning | Material handling

Plasma Oxyfuel

CPCut & PipeCut

MicroStep's pipe and profile cutting solutions are designed for processing of a great range of pipe diameters and lengths. The machines' modular design enables a wide range of pipe-based applications including trimming, cutting of various openings for multiple pipe and profile intersections or connections, weld edge preparation as well as pipe marking.

Pipes & profile | 2D cutting | Bevel cutting | Marking | Scanning | Material handling

Routing

MicroMill

AquaCut is a versatile waterjet cutting machine designed for processing of a wide variety of materials including those that cannot be subject to thermal or mechanical stresses. The machine can be equipped with a 5-axis waterjet rotator, as well as combined with plasma cutting, pipe and profile cutting or tapping. Further features include ABP technology and taper compensation (ABC).

Plates | Routing

Oxyfuel Plasma

CombiCut

This robust, high-precision CNC machine is designed especially for multiple-shift high-performance plasma and oxyfuel cutting. It allows cutting of steel up to 300 mm thick, bevel cutting with a pair of oxyfuel triple torches or rotators, parallel cutting with up to 8 torches, drilling up to Ø 40 mm, inkjet, micro-percussion or laser marking, as well as pipe and dome processing.

Plates | Pipes & profile | Dome | 2D cutting | Bevel cutting | Drilling Tapping Countersinking | Marking | Scanning

Oxyfuel Plasma

EasyCut

The EasyCut series stands for modern oxyfuel cutting at the highest level. It is the ideal system for precise and cost-effective oxyfuel cuts up to 300 mm and impresses with its robust, simple and maintenance-friendly design.

Plates | 2D cutting | Marking | Scanning

Laser

MSF Compact

MSF Compact combines precise 2D laser cutting with a compact design. Available in work area sizes of 1,000 x 2,000 mm, 1,250 x 2,500 mm and 1,500 x 3,000 mm, this highly precise machine is particularly attractive thanks to its small footprint. A manually extractable cutting table enables easy and straightforward loading.

Plates | 2D cutting | Marking

Laser

MSF Cut

The reliable fiber laser cutting machine for high-precision 2D cutting applications is available in three system formats with laser sources up to 8 kW – including an automatic shuttle table system as standard. The MSF Cut is a powerful production assistant to fulfill all standard tasks of fiber laser technology in a highly productive and high-quality configuration.

Plates | 2D cutting | Marking

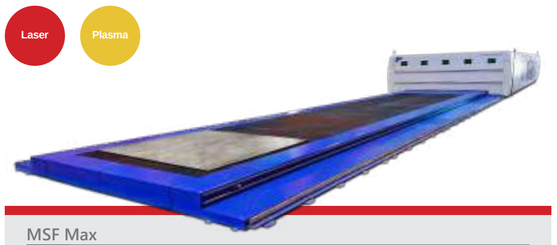
Laser

MSF Pro

MSF Pro is a powerful fiber laser cutting machine designed for the production of highly accurate parts at high cutting speeds, with surprisingly low maintenance and operational costs. The machine is equipped with an automatic shuttle table up to the size of 15,000 x 3,000 mm. The optional equipment includes pipe and profile cutting, and drilling, tapping and countersinking.

Plates | Pipes & profile | 2D cutting | Bevel cutting | Drilling Tapping Countersinking | Marking | Scanning | Material handling

Laser Plasma



MSF Max

MSF Max is a fiber laser cutting machine designed for precise processing – including efficient bevel cutting – of large-sized components. The machine offers an extensive production versatility, including 2D cutting, bevel cutting up to 45°, drilling up to Ø 30 mm, tapping up to M20, countersinking and marking.

Plates | Pipes & profile | 2D cutting | Bevel cutting | Drilling Tapping Countersinking | Marking | Scanning

Waterjet Plasma

AquaCut

AquaCut is a versatile waterjet cutting machine designed for processing of a wide variety of materials including those that cannot be subject to thermal or mechanical stresses. The machine can be equipped with a 5-axis waterjet rotator, as well as combined with plasma cutting, pipe and profile cutting or tapping. Further features include ABP technology and taper compensation (ABC).

Plates | Pipes & profile | 2D cutting | Bevel cutting | Drilling Tapping Countersinking | Marking | Scanning

Waterjet

WaterCut

WaterCut is a highly precise and reliable waterjet cutting machine designed for 2D or 3D waterjet cutting or a combination of waterjet and plasma. Besides a single tool station, the WaterCut can be equipped with a multi-tool station with outer span 1200 mm, carrying up to 4 water jets on a single Z axis, or a small drilling unit for piercing of sandwich materials.

Plates | 2D cutting | Bevel cutting | Marking | Scanning

Accessories | The right tool for every task

2D cutting

Plasma

Plasma tool station incl. anti-collision protection, laser pointer, arc-voltage THC and full support of plasma marking.

Laser

Laser tool station for fiber laser 2D cutting.

Oxyfuel | G-Multi

Oxyfuel tool station with manual tilting possibility up to ±45°. Fully automatic gas console with preset parameters ensures stable quality of cuts and best efficiency. Multi-tool version enables stripe cutting with stripe width ≥ 70 mm.

Waterjet | W-Multi

Waterjet tool station for cutting of all types of materials. Multi-tool version can carry up to 4 water jets on a single Z lifter.

3D cutting

Plasma rotator

5-axis rotary bevel head with endless rotation enables plasma bevel cutting of plates, pipes, profiles and domes up to 52°. The innovative ITH torch holder includes sensors for torch displacement detection, IHS and auto-calibration.

Plasma rotator 120°

3D rotator with a tilt range up to 120° and Z-axis stroke up to 1,500 mm enables cutting of 3D shapes such as open profiles I, H, U or L and domes.

Plasma bevel

Plasma bevel cutting head with a tilting ability up to 50° allows to perform a great portion of common bevel cutting jobs.

Laser bevel

Laser bevel cutting head with tilting ability up to 45° for fiber laser cutting of various types of materials.

Oxyfuel triple torch

Oxyfuel triple torch with fully automatic gas console enables bevel cutting of V-, X-, Y- and K-cuts with 3 oxy torches within bevel range 20° – 50°. Tilting angle and span of torches can be set manually or automatically.

Oxyfuel rotator

5-axis rotary bevel head with endless rotation enables oxyfuel bevel cutting of plates, pipes and profiles up to 60°. The innovative ITH torch holder includes sensors for torch displacement detection, IHS and auto-calibration.

Waterjet rotator

5-axis rotary bevel head for waterjet enables bevel cutting of all types of materials up to 45°. Adaptive taper compensation (ABC) and periodic height sensing (PHS) are included by default.

Automation & Calibration

ACTG | ACDB

ACTG station provides auto-calibration of tool geometry for automatic compensation of mechanical inaccuracy of the cutting tool as well as calibration of ABP scanner and automatic measurement of drill tools.

Nozzle changer

Automatic nozzle changer with a magazine for 8 nozzles provides the func- tion of automatic exchange of nozzles in the laser cutting head.

Machining

Blasting | Grinding

Solutions for removal of thin layer of surface (e.g. primer colour) from plate by shot-blasting or grinding technologies.

Drilling & tapping | Milling

MicroStep supplies a variety of drilling and tapping tool stations and automatic tool changer options. The robust DRM Max double-beam gantry also allows for a variety of milling jobs.

Positioning

Pipe & profile

Pipe cutting device is dedicated for clamping and turning of pipes and profiles. Together with a straight or bevel tool station and dedicated CAM software it offers the full range of pipe cutting applications.

Scanning

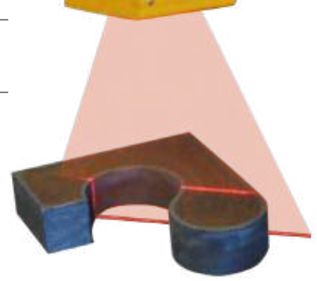
3D scanner

Laser scanner with a rotation and tilting ability allows to create detailed surface representations of scanned objects – e.g. profiles and domes. In combination with mScan technology it allows to adjust cutting plans according to true shape of 3D objects.

CCD camera | Automatic plate alignment

CCD camera can be used for:
a) scanning of the shape of template or rest plate for conversion into DXF
b) scanning of holes on plate for positioning
A laser sensor is used for scanning of plate edges for auto-alignment with the coordinate system.

ABP - Additional beveling process



Laser scanner dedicated for scanning of both the contour and position of a straight pre-cut part in ABP feature – additional cutting of bevels for weld edge preparation. ABP technology is available for plasma, laser, oxyfuel and waterjet cutting technologies.

Marking

Inkjet

1, 7, 16 or 32-nozzle inkjet writer provides multipurpose waterproof marking in industrial environment. It can write lines, characters, barcodes or 2D matrix codes. The marking speed reaches a notable 20 m/min.

MicroPunch

MicroPunch marking unit is designed for micro-percussion marking of plates, pipes or profiles with differently machined surfaces.

Laser marker

Laser marker allows to mark text, barcodes, 2D matrix codes and bitmap images with fiber laser.

Continuously moving forward

Alex Makuch – one of MicroStep's three Managing Directors – about strengths, goals and projects of the globally active enterprise

You are Managing Director of MicroStep since 2018. What are the highlights of your everyday work experience?

Alex Makuch: I like working with people, discussing problems and being part of a group that shapes the ideas into a solution. My primary goal is to create an "ecosystem" for my employees and not to stand in their way. I am happy to see people grow from both technical and managerial perspective, even more so when this growth is accompanied by a positive attitude towards the company and optimism regarding its future.

You are one of three MDs, together with Eva Stejskalová and Iren Brhlík. How do you divide your tasks and responsibilities?

Alex Makuch: It is an unusual structure but it is not unique. Our company has always had multiple managing directors with different responsibilities. Generally Eva is responsible for R&D, IT, the financial department and project management; Iren is in charge of both our production facilities in Hriňová and Partizánske (Slovakia) and logistics. I oversee the front-line departments including sales, marketing, technical support, application engineers and aftersales. The advantage of this structure is that each director is accountable for his/her departments and each of us can immediately oversee activities of the other two. This ensures better decision-making because each decision is evaluated in an early stage from multiple perspectives. Everybody has peers to consult his/her decisions with and can better focus on his/her particular areas. We discuss questions and problems with each other, offer advices and propose solutions.

Mr. Makuch, what is your history with MicroStep?

Alex Makuch: After finishing my studies at the Faculty of Electrical Engineering of the Slovak University of Technology in Bratislava, Slovakia, I continued to work there at the Department of Control and Automation. Before the fall of the communist regime we worked on several engineering projects for the industry in Slovakia that were realized through the university. Our situation changed significantly with the Velvet Revolution in 1989 which made private entrepreneurship possible again. Together with a few of my colleagues from the faculty we decided to make use of the new situation and founded our own company, MicroStep. At first, we wanted to focus on general control systems and automation of production lines and other motion systems. We worked on multiple such projects including control nodes for large hydroelectric power plants and control systems for small hydroelectric power plants. What pointed us towards CNC cutting machines was a job to create a complete control system for an existing CNC plasma cutting machine in 1992. After successful completion of this task we continued to work on other projects, but gradually started to shift our resources more and more towards CNC cutting. After some time, we joined our forces with a group of mechanical engineers and the rest, as they say, is history.

> „Our unusual structure ensures better decisions."
>
> **Alex Makuch**
> *Managing Director*
> *MicroStep*

MicroStep's slogan is "Your Partner for Cutting and Automation". How many customers worldwide trust your solutions today? In your opinion, what are the most important reasons why these companies rely on MicroStep's technology?

Alex Makuch: We sold more than 3,000 machines and many of them were bought by returning customers. That is the greatest validation of our efforts. We view these repeated purchases as a very positive sign. It shows us that the solution promised during negotiations – and subsequently delivered – has met or even exceeded customer's expectations, that we solved any problems that may have arisen and provided prompt service and assistance. MicroStep always tries hard to work out any possible issues.

We usually provide more innovative products with more features than other producers in our segment. Our machines produce high quality parts that usually do not require any further machining. This brings substantial decrease in production costs for our customers. MicroStep offers them solutions, not just standalone machines. Each system is offered with the option to integrate it into customer's production facility, both by hardware and software. Our goal is to help increase their productivity with a focus on production automation. These efforts are supported by the fact that we make all of the software and almost all of our hardware in house. This gives us great leeway when designing customer-specific machines. Many of our competitors simply cannot do that and our customers greatly appreciate the fact that we can.

The main strength of MicroStep are strong, experienced and capable people who make all of this possible.

To keep it that way in the future, MicroStep invests heavily. What measures are you taking to strengthen and expand your market position?

Alex Makuch: MicroStep is continuously investing into its assets. Recently we built a new 1,200 m² workshop and yet another workshop with an area of 1,500 m². We have also purchased a new blasting machine, a new horizontal table-type milling machine, a new press brake machine and have augmented our production with several new machines of our own brand in order to increase our productivity and improve the overall quality of our machine park. However, we realize that our biggest asset are our employees. This is reflected in our shareholder policy. People who have been with us for some time and have proven themselves get an opportunity to buy a share in the company. This unorthodox system ensures stability and continuity for the company as well as personal investment of the shareholding employees. Furthermore, we continuously provide our managers and other employees opportunities to improve their interpersonal skills in trainings organized for them.

We are convinced that the key to our success is a strong R&D base. We now have more than 70 highly skilled developers who focus on improving our products and their individual parts and on increasing their automation level. We are also observing an ongoing trend of fewer and fewer young people being interested in pursuing manual labor jobs. This leads to lack of manpower and further increases the potential of automation – this trend is in fact leaning with our company strategy. Our goal is to produce fully automated manufacturing cells in accordance with the philosophy of Smart Industry. At the moment, this means augmenting our CNC machines with automatic workpiece stock and loading systems, as well as systems for sorting of cut parts and scrap material. The aim is to increase production capacity of our machines and to allow their integration into automated factories. We are also working on improving diagnostics and predictive maintenance that will significantly increase reliability of our products and minimize their downtime. We have had these features in our machines since before the Smart Industry concept was a thing but we are still looking for new ways to improve and broaden their functionality.

What new challenges is MicroStep facing in your opinion compared to 10 years ago?

Alex Makuch: The global pandemic and the current international situation have brought many non-standard issues that were not present 10 years ago. Soaring energy prices, manpower and material shortages, being the most prominent ones, often lead to more tense and complex situations than before. We are monitoring these problems day by day and try to solve them as soon as they come up.

> „We are convinced that the key to our success is a strong R&D base."
>
> **Alex Makuch**
> *Managing Director*
> *MicroStep*

On a more general note, MicroStep has been growing for the last 30 years and we have crossed the threshold between being a small company and a big one. This brings forth many challenges like the necessity to adjust the organizational structure and internal processes, standardize production as well as all the related administration. We are continuously moving forward with our main strategy, which is to give our customers solutions to their particular needs, ideally with a good amount of automation. We are becoming well known in this area and are currently working on many complex projects where we handle not only the cutting part but also material manipulation and its transport between individual nodes of the production line, or the entire workflow of a production line and its connection to the customer's ERP system. There are not many producers able to deliver such complex solutions. These projects require a lot of research and development and put strain on our human resources. With more and more complex projects, our challenge right now is to find new, experienced people for the emerging specialist positions needed to bring these projects into fruition.

Last but not least, there is the challenge of maintaining a stable and well-educated network of partners all around the world. We are aiming to have a company representing us in each country that we sell to. Our local partners are able to provide swift service and their knowledge of the market increases the chance to land complex projects.

Where do you expect MicroStep to be in 10 years?

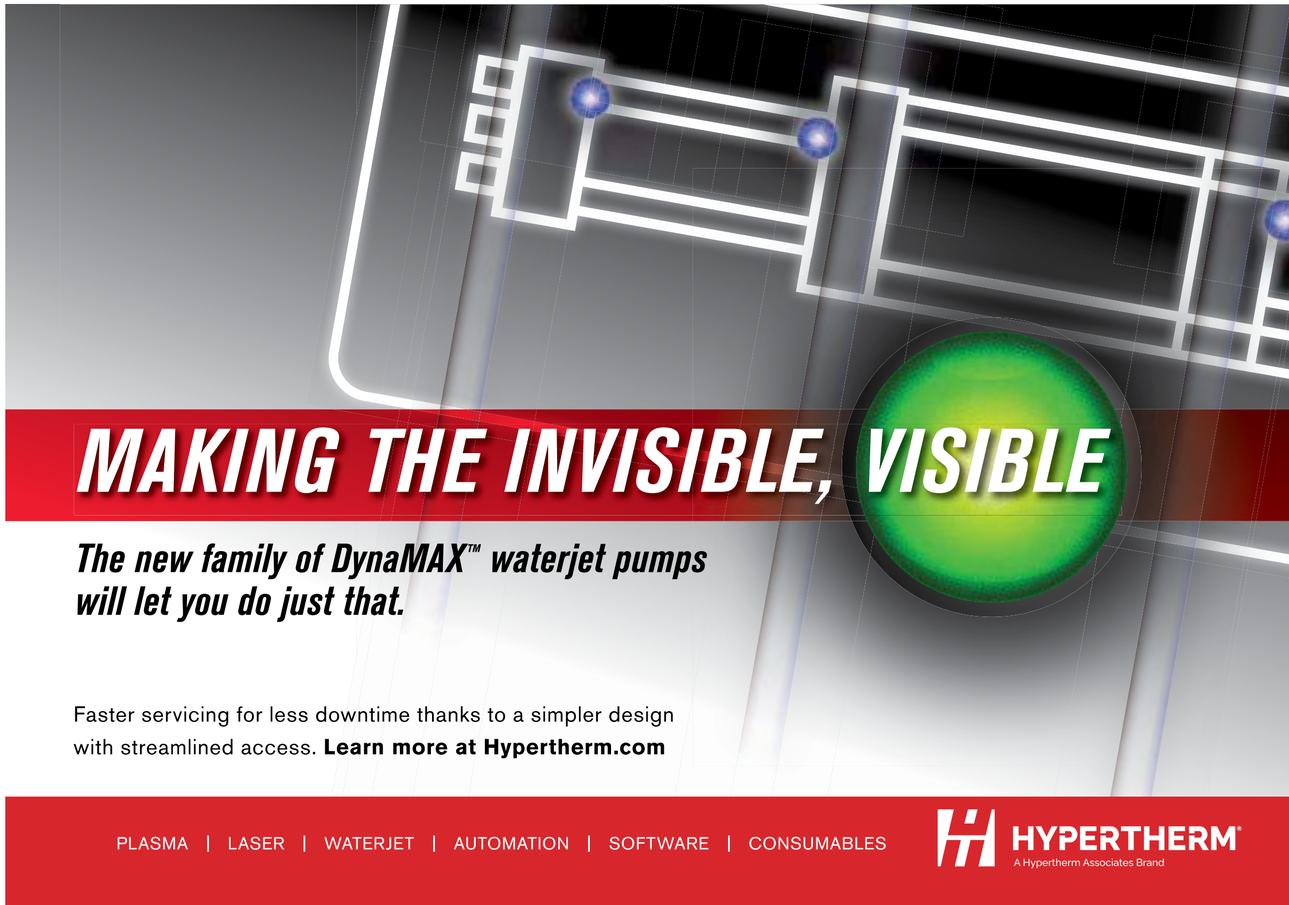
Alex Makuch: We have always been proud to belong among the most innovative companies in our segment. Over the years we brought multiple new features to the market, many of which have been later copied by our competitors. We want to continue in this trend and simultaneously increase the number of complex projects.

I believe that the future will favor only those who will be able to deliver cutting-edge solutions. CNC cutting machines are complex mechatronic systems with an extensive software suite. Only companies that command a strong R&D base, including specialists in the field of mechanical design, control systems, software tools and integration interfaces, are able to design such systems.

Furthermore, we see great potential and opportunities in expanding to the American continent. In this spirit, we have been looking for new partners in these territories and it makes me happy that we have already landed several very interesting orders and have even delivered innovative solutions across the Atlantic Ocean.

How do you relax to take your mind off the challenges of everyday work?

Alex Makuch: The thing that unwinds me the most is spending time with my family. Apart from that I really enjoy sailing, cycling, playing tennis, skiing, basically any outdoor activity in general.



MicroStep – 30 years of cutting and automation

The company MicroStep was established in 1991 by members of the Department of Automation and Regulation, Faculty of Electrical Engineering and Information Technology, Slovak University of Technology in Bratislava, Slovakia with the aim to develop and deliver microprocessor-based control technology to various branches of industry. Over the years, the company has become one of the leading suppliers of cutting equipment that is represented by strong channel partners spread over 58 countries.

MicroStep is offering the full range of contemporary cutting technologies – plasma, laser, oxyfuel and waterjet – along with a great variety of supplemental equipment and software for drilling, tapping, countersinking, marking, process synchronization, automated material handling and robotic solutions. As a producer of not only the machines themselves but also of control systems and CAM software the company delivers solutions that fit custom demands and are future-proof with respect to machine extensions in size and additional technologies. MicroStep's machines can process different types of materials including plates, pipes, profiles, beams, domes and elbows while implementing advanced automation processes. All of MicroStep's machines are controlled by a multi-tasking PC-based control system developed and produced in-house. The focus of the company are hi-tech machines that accommodate industry's latest trends – delivery of fully automatic workplaces, which integrate different cutting/drilling/marking technologies in combination with automatic loading and unloading systems, following demands for higher level of machinery automation and interconnection of control systems, CAM software and ERP systems.

MicroStep's rapid growth in its 30+ years' history resulted in founding of several subsidiaries, most notable of which are MicroStep Europa GmbH in Germany, MicroStep USA and MicroStep China. Together with subsidiaries, the company has a total of over 500 employees, out of which more than 10 % are working in the field of integrated development of mechanical and electronic nodes of CNC machines and control system software. The company operates two production sites in Slovakia in the towns of Partizánske and Hriňová. In addition to its own R&D base, MicroStep works closely with departments of the Slovak University of Technology in Bratislava and the Institute of Materials & Machine Mechanics of the Slovak Academy of Sciences on utilization of latest achievements in design and control of machinery.

Thanks to its innovation driven production, MicroStep has become a valued partner for industry´s leading manufacturers: Hypertherm, Kjellberg, IPG, nLight, II-VI, Precitec, KMT, BFT, IHT, GCE, Harris in the field of cutting technology; Bosch Rexroth, THK, HIWIN in the field of linear motion components; Festo, Asco Joucomatic in the field of pneumatic components; Donaldson, Kemper and Teka in the field of filtration systems, Panasonic in the field of motor controls and ABB, Fanuc, Mitsubishi and Stäubli in the field of robotics.

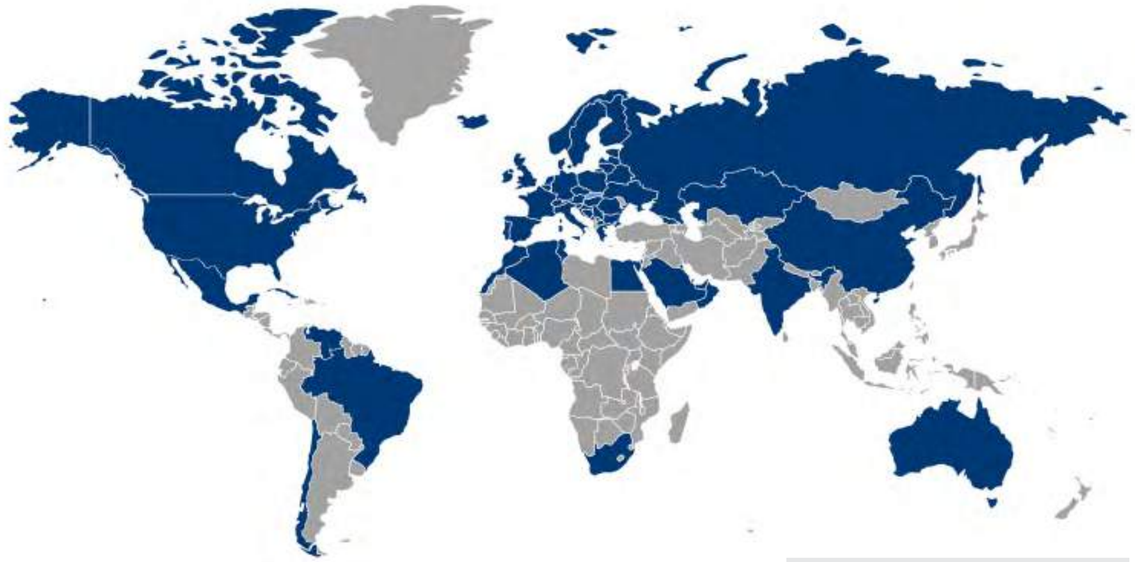
Multifunctional CNC cutting machines

PLASMA – LASER – OXYFUEL – WATERJET – DRILLING – TAPPING – COUNTERSINKING – MILLING – MARKING

- Processing of plates, pipes, profiles, beams and domes
- Combinations of technologies on one machine
- A wide range of accessories
- Automation & Digitalization solutions
- CAPP applications for production management
- 2D & 3D CAM software
- Robotic solutions

The MicroStep World

Present in more than 50 countries worldwide



MicroStep | Your Partner for Cutting and Automation

Through a network of authorized representatives, MicroStep is present in 58 countries. More than 90% of our production is destined for export. Apart from our home market – Slovakia – and almost all European countries, MicroStep cutting machines also operate in the USA, Canada, China, Russia, South Africa, the Middle East, India and Australia. In the field of plasma cutting, the company belongs among the world's largest producers.

Contact the MicroStep representative in your area to discover the variety of MicroStep's products and features!

Our customers | Strong partnerships at a global level

The technology of MicroStep and our long-term experience in the cutting and automation fields have helped us to build a user base spread across many different industries, from schools and small workshops to big multinational enterprises. The know-how of our employees helped realize more than 3,000 cutting machines worldwide. We appreciate the trust of each of our customers, among others:

MicroStep spol. s r.o.

Alex Makuch
Managing Director
MicroStep

"Our success would not be possible without strong partnerships with our suppliers and, most importantly, without the profound commercial and technical abilities of our sales partners. Together we make it happen."

MicroStep®

Your Partner for Cutting and Automation

Complex & Multi-functional

There is hardly any other CNC system with such a variety of technologies provided by a single machine for such a variety of materials: sheets, pipes, profiles, beams as well as domes. MicroStep is offering such versatile and efficient solutions by nature.

See the cut sample above – bevel cutting of contours and openings, drilling, tapping, countersinking, punch marking and contour marking, all delivered in a fully automatic mode by our multi-functional plasma all-rounder MG.

And such versatility can be experienced in laser, oxyfuel and waterjet fields as well. For example, our modular fiber laser system MSF Pro provides bevel cutting of plates and pipes along with drilling, tapping, countersinking, marking and automatic material handling options.

Contact the MicroStep representative in your area!

For more information visit:
www.microstep.eu/dealers

Product Catalog

Information on all MicroStep cutting systems can be found in our current product catalog.

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MicroStep®

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