

NEWS

4.0 TECHNOLOGY

FLEXIBILITY

CONNECTIVITY

PARTNERSHIP

ROBUST

**OPEN
TO YOUR
WORLD**





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Editorial

The world is presently anything but a peaceful place. Europe seems to drift apart, the advance of nationalists could only just be stopped. At EMO, in contrast - the «Exposition Mondiale de la Machine Outil», which is the world exhibition for machine tools - exhibitors from all over the world and all metal processing industries meet as in every second year to present their products. Here, technology and innovations are in the focus. And along with them, the issue of the future production, «Smart Factory».

It is about the global networking of manufacturers, suppliers and customers, about data access via clouds, downtime optimisation and preventive maintenance. This scares a lot of people, but will facilitate and enhance many aspects in production in the long term.

Apart from the omnipresent big data discussions, the relationship between suppliers and customers still has traditional features in Germany. The customer expects the supplier to be innovative, to implement manufacturing demands into products, to keep prices low. We at Fagor have relied on strategic partnerships with our customers since many years. We listen to our customers. Their suggestions trigger innovation, make affordable solutions possible. In this way, our developments are in line with market trends. We put emphasis on short delivery times, which are between 4 and 6 weeks with standard products. As well we focus onto a respectful interaction with our customers. Excellent consulting and innovative application solutions are part of this.

The German market is still one of the most important ones as regards testimonials. For the world's most appreciated machine tools still come from Germany. In 2017, VDMA Mess- und Prüftechnik visited the Fagor production facility in Mondragon. At this occasion, too, discussions were about «market partnership» and the opportunities offered by Industry 4.0. We are delighted that the German market increasingly uses our products. The response from OEMs is consistently positive. Please read a selection of these success stories in this magazine.

Come and meet Fagor at EMO. We are looking forward to presenting our new products to you.

Kind regards

KLAUS RICHTER

CEO FAGOR AUTOMATION GERMANY



*Licon director Winfried Benz is relaxed when he looks ahead to the company's future:
«With our LiFLEX double spindle machine and their high productivity, we are an interesting solution for many industries».*

LICON MT GMBH & Co. KG

Configuration diversity

Licon MT in Laupheim consider themselves as a system supplier. This has not always been the case, but with the appointment of Winfried Benz as director in 2001, a process was initiated of continuous development away from special machines that contained the risk of unilateral dependency on individual customers to machine series whose strength resided within their modular structure design, hence resulting flexibility.

The present orientation of the company is successful. With approximately 180 employees, Licon has generated sales growth each and every year. Forty employees work in development alone. «We have a very academic approach», explains Winfried Benz. «Our philosophy is to develop and design all components of our machines ourselves. We have a high-tech product with a lot of technical expertise, which we do not want to give away, since it provides us with a better positioning within the market».

Many components such as the spindles, which are available in a wide range, are manufactured by Licon internally. Machine beds and castings, as well as electrical and hydraulic components, and of course encoders are purchased.

All purchased components have to be of best quality available within the industry.

Licon customers are found in the automotive industry, but also in general mechanical engineering and also within the fittings sector. The desired diversity of industries has continuously developed and grown. «We do not specifically search for new customers, but rather customers approach us, since they have the right application for our machines and our conceptions - in combination with our high system competency - are the most promising for it», says Winfried Benz.

The horizontal machining centres of the LiFLEX series are available with single and double spindles. Meanwhile, the portfolio includes three platforms with a large variety of



LiFLEX II 1066 is the largest among horizontal double spindle machines in the Licon portfolio. Workpieces with a size of up to 1,000 mm can be processed in one setting in this machine.

machines capable of a very broad variety of different applications. Common features of all machines are high stability, robustness and dynamics - important prerequisites for large machining volumes and high precision requirements at the same time. Licon customers manufacture challenging components and assemblies, both in small and medium-sized batches as well as in large series. In small and medium-sized series, a high degree of flexibility is typically required in regards to convertibility. For this reason, Licon offers the possibilities of automation such as pallet changers and double pivoting beams, which are available for each machine variant, thus the integration of the machines in most manufacturing line is accomplished without difficulty.

The introduction of the new LiFLEX series in 2012/2013 went along with the question as to which components should be used for the machines. Two important requirements should be fulfilled: the implementation of short delivery times and forward-looking price calculation - that is a good price-performance ratio of the machine components. For this reason, all components were scrutinized at the beginning and analysed as to whether the design was correctly optimized or whether something could be omitted. The objective set by the development department was a

higher degree of standardisation with the largest degree of flexibility. And: Innovations in mechanics and electronics can have an enormous savings potential.

The issues of price calculation and planning safety on the supplier side were also scrutinized to insure the short delivery time requirement of less than 12 weeks was accordingly met.

In addition to a long-term supplier of encoders, an optional supplier was inquired, Fagor Automation. Winfried Benz: «There were no significant quality

There is no difference in the quality of products among manufacturers - it is rather a matter of short delivery times and a good price-performance ratio.

differences among different suppliers of encoders. So the more interesting factors were short delivery times and a good price-performance ratio. It is not good to be dependent on a single supplier - neither as regards to pricing nor in regards to delivery times». The teams' feedback was positive: «Support from Fagor was good from the beginning. The people from Fagor faced a difficult situation in the beginning and managed it perfectly. We can grant a very good

supplier rating in this case: first-class support, direct contacts and rapid solutions!»

Klaus Richter, director of the German branch of Fagor Automation, says: «We have delivery times of 4-6 weeks for standard products. This provides our customers with planning safety. Good service and direct contacts for customers are very important for us. The German headquarters of Fagor Automation possess a distribution and a service division are located in Swabian Göppingen. This is where we also have a local storage facility for standard systems in order to ensure rapid availability. This means we can quickly respond to inquiries».

The Fagor encoders used in LiFLEX machines are of the GAS series types. Approximately 50% to 80% of the machines are equipped with Fagor scales today. Up to 100 machines are dispatched from the facility in Laupheim every year - with upwards growth each year. Up to 10 machines can be completed simultaneously in the sparkling clean workshop.

Licon train new staff for their powerful teams themselves: Thirty trainees in different stages of training are currently employed by Licon. It is a matter of fact that the company was recently awarded the Top Job Siegel prize by the Zentrum für Arbeitgeberqualität (Centre for Employer Quality). ■



imes-icore Director Christoph Stark is satisfied. Around 6500 CORiTEC machines have been delivered already, and 1000 will be added each year.

IMES-ICORE® GMBH, EITERFELD

Challenging medical engineering

imes-icore GmbH integrates the entire know-how in the development, production, distribution and servicing of complete CNC machine systems and all required accessory components including CAD-CAM applications.

Their divisions comprise of machining, laser, water jet cutting, medical engineering and measurement technology. The customers are primarily active in mechanical engineering, plant construction as well as in dental and orthopaedic technology.

imes-icore consider themselves as a technology provider - equally strong in machining, cutting and also additive processes in the future. imes stands for integrated mechanics, electronics and software, icore for integrated dental solutions». Specialist solutions for CNC

milling machines range from automated production systems for custom sporting weapons, horse saddles, eyeglass frames, orthopaedic shoe soles or jewellery.

In the beginning, the first solutions developed, designed and manufactured for the medical engineering market were special machines. However, imes-icore Director Christoph Stark had an idea for dental product manufacturing, a method for digitizing the required parts and produce them in small series.

In 2003, CORiTEC was presented as a machine for the productive and

custom-fit manufacture of moulded parts for dentures at the trade fair IDS (International Dental Show); this was the first real series machine in the portfolio of imes-icore. Christoph Stark explains: «With our dental milling machines, we were among the first and still are one of the top suppliers worldwide - and I assume we are the most innovative and the one offering the most variants, namely ten types of machines».

The challenging 5 axis simultaneous processing is accomplished within a precision setting in the micro-range

is implemented with the innovative CORiTEC 650i machine. The 650i processes all materials used in the dental industry, such as CoCr, titanium, zirconium dioxide, plastics, glass ceramic block materials and others, with the highest precision possible.

The machine is equipped with a HF spindle reaching up to 80,000 rpm, as well as with linear/torque drives in all axes.

Fagor has the same innovative approach we have, our collaboration is therefore productive and good. Their flexibility, too, is of benefit to us.

The granite machine kinematics with its high degrees of freedom of the five axes of over 30° allows for milling and grinding wet and dry in the highest quality for almost every application. An automatic 20-fold tool changer and an optional integrated automated 16-fold dental material changer allow for operating the dental milling machine around the clock with no supervision, thus allowing the ability to precisely mill high numbers as well as complete time-consuming work such as implant-supported dentures.

We are very happy with our decision. Fagor works with a high customer orientation, and their sales staff also make the impossible possible sometimes.

The new CORiTEC 650i machine had previously been equipped with open encoders on the linear axes. The concern that these open systems could possibly result in problems due to their susceptibility to contamination in the long term convinced the responsible imes-icore engineers to begin a search for alternative solutions on the market with the basic premise, the linear encoders should be enclosed.

CNC communication preferably takes place via Panasonic or BiSS protocol. Fagor systems are characterized by the fact that they can be connected to a very wide variety of different systems and platforms and includes the Panasonic interface as standard offering. Sebastian Ullrich, R&D Head with imes-icore, explains: «Support from Fagor in this matter was very good from the beginning. The technical experts on both sides found a good approach very quickly - it was implemented with excellent commitment on both sides and completed in the very solution for which we had searched».

Christoph Stark agrees without reservation: «Fagor has the same innovative approach we have, our collaboration is therefore productive and good. Cooperation with the Spanish parent company, too, is without any complications in communication. If you don't have this, you lose weeks and months in adaptation; this is lethal for a creative, innovative approach. «We are very happy with our decision». Their flexibility, too, is of benefit to us. Fagor works with a high customer orientation, and their sales staff also make the impossible possible sometimes». ■

The highly precise dental milling machine CORiTEC 650i is equipped with Fagor encoders.





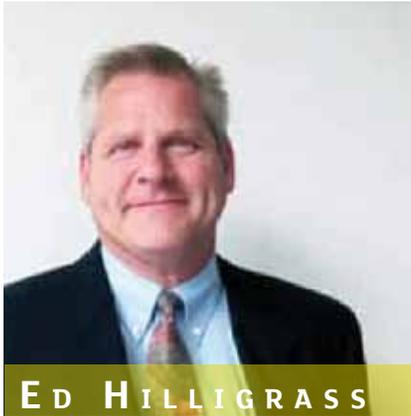
Diversified Machine Systems and Fagor partner to provide IOT/Industry 4.0 solutions

Diversified Machine Systems (DMS), a privately-held corporation with headquarters located in Colorado Springs, Colorado, is an industry-leading designer and American manufacturer of 3 axis and 5 axis CNC routers and machining centers. Supplying machines to a wide variety of manufacturing sectors including aerospace, automotive, marine, recreational vehicles, 3D sculpture, concept models, pattern making, formed plastics and woodworking among others, they have thrived as a Company that is always on the Leading edge of Technology.

All engineering, structural fabrication and machine assembly takes place in their Colorado Springs facility and includes complete in-house mechanical and electrical engineering, welding and steel fabrication, a fully-equipped machine shop, a large scale CNC machining center, mechanical and electrical

assembly operations, control system integration and the final quality control test processes.

The DMS Quality Assurance Program pays close attention to every detail in order to guarantee that each machine is of the highest quality and standard of reliability for any CNC router



available on the market. In addition to manufacturing 3 Axis CNC routers and 5 Axis CNC machining centers, the company provides full technical product support and a complete spare parts inventory. With our expertise and unwavering commitment to quality, DMS is able to meet the strictest tolerance standards required by our clients using advance materials in industries such as aerospace, automotive and medical. As our customers continue to develop new uses for our advanced CNC machining centers, we adapt to meet their needs.

We sat down with Ed Hilligrass, Vice President of DMS to talk about implementation of IOT solutions.

Ed, are your customers asking for IOT/ Industry 4.0 solutions?

Yes IOT/I4.0 is asked for often when implementing manufacturing and OEE solutions. (Overall Equipment Effectiveness) Clients are asking DMS as a CNC OEM in order to leverage our knowledge of the machine tool as it relates to aligning and improving their manufacturing operations through automation and integrated solutions.

Which Fagor CNC is your primary choice for your machines going into this market?

The most common tends to be the Fagor 8065 with the Touch Screen capabilities

Is there features or flexibility from the 8065 CNC that helps you achieve your goals in this sector?

Absolutely. Unlike other control systems our clients have experienced in the past, DMS provides a full featured Fagor control package that includes the console, motors, drives, and feedback systems that are scalable to many different processing styles and material types utilizing the custom screen/editor and 3rd party software ability of the 8065 CNC.

How are you exchanging information within a Smart System?

Over the past 10 years, DMS has invested in the integration of technologies that preceded other communications standards. The investment has allowed DMS to work directly with the Fagor control system at the TCP/IP levels allowing for ease of communication and integration with existing and new MES product implementations by utilizing a standard and secure high speed base level protocol.

Have you utilized any 3rd party software for assistance?

DMS technologies such as Dashboards, Machine Data Collection, Barcode and RFID scanning, Schedulers, and others provide a fully integrated software solution and global support through our partnership with CIMCO. The seamless integration the DMS CIMCO solutions are at the heart of Operational Equipment Effectiveness (OEE).

With CIMCO, DMS is capable of providing a centralized Manufacturing Data Management (MDM) system to collect and maintain nearly any facet of the CNC operational information our client's desire including IOT/I4.0 solutions. And where the machine operator interactions need to be collected, clients can build customizable operator screens to record operator actions that cannot be automated. When utilizing the Fagor 8065 Touch Screen and programmable

short cuts, any of the MDM or operator screens can be accessed directly from the Fagor console saving clients the cost of a shop floor PC at each CNC.

Can you provide an example of a particular process?

Yes, one of our projects is the integration of Autodesk Power Inspect into the DMS Machine. In conjunction with the Fagor 8065 Probing ability we not only Probe the part for basic inspection purposes, but we then also have the ability to compare the data to the CAD model. The results are then generated into detailed reports that can instantly be shared with all personnel ranging from the Quality department right up to Senior Management. We believe this capability is a real Game Changer in the industry.

DMS offers the full CNC-Servo-Scale Fagor Solution, is there a benefit to this?

While providing a complete Fagor Control Systems allows DMS to provide a full 2 year warranty on the entire control system, DMS support can quickly diagnose electronic system issues when they arise without have to troubleshoot compatibility issues down to the component level across multiple vendors.

Is there a specific DMS customer market that requires IOT solutions more than others?

We find the need for these types of horizontal products across all industry verticals where companies are implementing OEE automation solutions.

Do you see any new trends in the market you would like to discuss?

While it's not a new trend, we do see the ongoing expansion of manufacturing in the US with a focus on automation and operational transparency with regards to manufacturing data, business planning and maintaining a competitive edge. ■

In 2015 Ed Hilligrass and DMS received the 45th Annual Governors Award for Excellence in Exporting by the Colorado Office of Economic Development & International Trade. DMS was also awarded a 2014 Colorado Companies to Watch Winner, named a 2015 Made in Colorado Award Winner, and ranked #101 in the 2014 Top 250 Private Companies in Colorado, and chosen as a 2015 ACG Denver Growth Awards Nominee. DMS was also honored with the 2013 Regional Business Alliance Excellence Award given by the Colorado Springs Regional Business Alliance.

For more information, please visit the DMS Website: www.dmscncrouters.com

EXERON GMBH, OBERNDORF

Experts in EDM and HSC

exeron offers a complete range of products for mold making and tooling industry. Their winning mantra: combining the synergies of eroding (EDM) with High Speed Cutting (HSC) milling and associated automation. They provide highest quality product to the industry and demand the same from their suppliers.

In 1966 Herbert Walter established an EDM shop which later emerged as exeron GmbH. Today they employ over 100 people and compete with largest corporations around the world in the design and construction of EDM and HSC milling centres. exeron ships around 130 machines every year from their Oberndorf facility.

Herbert Walter has been extremely innovative from the beginning. In 1978, he launched his first product on the market: the vertical EDM HW100. Walter supplied this machine

to many small job shops in the Black Forest area. Then, in 1985 – while already operating under the name exeron - the gantry-type EDM exeron 304 E was introduced and has been a trendsetter in the industry ever since. Upon the acquisition of Digma-Technikkompetenz specializing in HSC milling in 2005, exeron became a system supplier for machine tools for metal processing. The next step in combined systems consisting of EDM machines and HSC milling machines with robot loading/unloading -gave rise to unmanned production facilities.

exeron Director Bernfried Fleiner: «We expect and consequently deliver high quality machines».





The spark eroding machines of the EDM series are equipped with Fagor encoders and our own exeron controller. The EDM 313 is one of six available variants in this series.

exeron Director Bernfried Fleiner explains: «Tooling engineering and mold making experienced large productivity potential in high-speed milling. In particular Tooling engineering requires synergies from both EDM and HSC milling. Having recognised that early exeron started to provide full range solutions to both areas of industry including the associated

With regard to vital supply safety, which is important for smooth running of operations, both our supplier's delivery reliability and the continuous high quality of the supplied components is decisive.

automation-which is unique. Although our competitors are much larger in both business areas however consistently being on the leading edge of the technology differentiates and sets us apart. We ensure vertical manufacturing of significantly over 50% of the processes by our inhouse development teams of mechanical, electric and software departments including the engineering

and electric cabinets which are built to DIN standards.

Most of exeron customers in tooling engineering and mold making belong to aerospace, plastics, aluminium and medical industry. Apart from high precision, reliability is an absolute must for machines in these industry- as most facilities in this sector operate around the clock with multiple day shifts. This Oberndorf-based company designs their machine beds in mineral cast for utmost stability and absolutely low vibration. «The quality of our products has been and still is a critical criteria for our customers», says Fleiner.

Of course, Fleiner expects the same level of quality and precision from their suppliers, too. In general, the company primarily purchases components from suppliers in a radius of around 100 km. «With regard to vital supply safety, which is important for smooth running of operations, both the on time delivery and the continuously high quality of the supplied components is decisive in determining the final product quality.

«From the very beginning Fagor Automations was very convincing in both aspects», explains Fleiner.

The first contact between exeron and Fagor Automation dates back to 1991.

The vicinity of Fagor's site in Göppingen was a favourable argument and also the necessity of a second supplier. However the initial experience was so pleasing that since 1996, all EDM series have been equipped with a combination of exeron control and Fagor encoder systems. «There are no quality differences between the manufacturers. So we were very happy with our decision. Their flexibility, too, is of benefit to us. Fagor works with a high degree of customer focused approach and their sales staff also make the impossible possible sometimes. The fact that Fagor encoder

There are no quality differences between the manufacturers. So we were very happy with our decision to use Fagor encoders.

systems also offer benefits with regards to costs, is another big plus», says Fleiner. And he adds: «It is always about investment safety when it comes to machine and component procurement, about the certainty, that you will get spare parts and support even after ten or more years». ■



Dirk Klüppelberg and his technical director Friedhelm Goesmann together are a well-functioning team.

KLÜPPELBERG GMBH, KERPEN

Retrofit in supersize format

Every so often, entrepreneurs need to decide about upgrading their machines to stay with modern technology. Whether or not a new machine should be purchased or a technical retrofit on an existing machine could be an alternative - such questions are clarified by a specialist like Dirk Klüppelberg and his crew.

The control engineer Klüppelberg had been travelling worldwide for many years for the machine tool manufacturing company Kolb in order to commission and provide maintenance to these machines. In 1994, Klüppelberg decided to set up his own business and supplemented his technical service work by developing and manufacturing upgrade modules over the years. Today, around 22 years later, Klüppelberg and his 17 highly specialised employees generate around four million [Euros] of sales per year in fixtures design, machine

manufacturing, automation technology and retrofitting. The vertical range of manufacturing is practically zero. «We concentrate on our core competencies, the design and installation of machines and components in our portfolio», says Klüppelberg. «The manufacturing of castings or gears is a specialized work. We purchase these components in batch sizes of 1 from companies with the required expertise in this field and the production facilities. Especially in the retrofit area, there are numerous numbers of different parts

with special sizes; this is impossible to manage internally from the financial perspective».

Realizing this challenge in 2005, Klüppelberg decided to no longer maintain and repair Kolb machines, but offer a complete upgrade if requested. The customer base existed already, the required know how had been acquired during the years of self-employment, and with the current technical director Friedhelm Goesmann, a wise and prudent expert had been available for many years. The largest project so far:

the overhaul of a Kolb Pentamat at a Finnish manufacturer of large motors, for whom Klüppelberg had been providing maintenance services during earlier years.

One of the key requirements/challenges was the expansion of the existing tool magazine from 300 to 600 pockets to receive both SK50 and SK60 tools. The scope of performance hence included the extension of the base by approx. 6 metres on the entire width of the

We went for Fagor, since we felt during the first meetings that they are very customer focused and solution oriented company.

existing magazine. A total of 4 new processing modules as well as a completely new electrical system based on a Siemens 840 Dsl CNC system completed the general overhaul. Overall the team needed a bit more than eight months to complete the challenging tasks.

In order to limit upgrade costs- which are so important in any retrofit project, we needed the right suppliers for the parts to be replaced. In this regard, it is frequently not only a matter of price, but also of whether the part can be made available as requested. Linear encoders with steel tape did not seem to be available in all lengths requested, at least not from our previous supplier. For specific lengths, one would have had to use glass scales. «This was not an option for us, as this would not have allowed us to use old enclosures and also this would have meant working with two different feedback systems. Removing the old and installing new enclosures for the encoders in all axes would have significantly have driven up costs», says Dirk Klüppelberg. «It was clear upon our first contact with Fagor in 2014 that supplying the requested lengths would not be a problem with Fagor.

Goesman, too, was impressed: «We went for Fagor, since we felt during the first meetings that they are very customer focused and solution oriented company.

They spent time with us understanding our limitations and concerns, and when we noticed that the encoder length

required by us was within Fagor's standard range and would be deliverable without any problems, we finally knew that we had made the right choice».

Currently, Klüppelberg practically uses Fagor exclusively. «Our cooperation is uncomplicated and target-oriented. Apart from their standard solutions, we noticed: even if we need something customized, Fagor is the right address».

Meanwhile, Klüppelberg practically uses Fagor exclusively. «Our cooperation is uncomplicated and target-oriented. Apart from their standard solutions, we noticed: even if we need something customized, Fagor is the right address».

In the field of retrofitting, Fagor products provide a formidable solution due to their openness and the resulting flexibility. Goesmann and Klüppelberg agree:

«This flexibility suits us very well. For our work is anything but a vanilla». ■

The retrofit took eight months and was largely performed on site due to the large dimensions; the workpiece - a motor before processing - on the left; the new enclosure in the centre.





Christian Volz, director, and FAGOR application and service engineer Thomas Gebauer.

VOLZ WERKZEUGMASCHINEN GMBH & CO. KG, WITTEN

Controls and digital displays

VOLZ Werkzeugmaschinen GmbH & CO. KG offers a wide range of high-quality machines and systems of reputable manufacturers in the fields of turning, milling, drilling, sawing, grinding and plate machining. Additionally, Volz distributes machines and peripheral equipment under their own name.

Volz machine and application engineers are stationed throughout Germany to ensure comprehensive support - from machine installation and commissioning to CNC training and the complete range of after-sales services. The complete «one-stop» solution provider maintains an up-to-date 500 m²-large spare parts and accessory centre. This ensures the flexible and timely supply of spare parts and reliable support; even several years after the expiry of warranty.

In their large showroom of 3,500 m², among other things, Volz displays Buffalo and Jessey machining centres

and turning lathes. Around 90% of these machines are equipped with Fagor CNCs.

Christian Volz, director of Volz Werkzeugmaschinen GmbH in the 2nd

We have cooperated very well with Fagor since the 1990ies. Fagor's overall package is just right.

generation, says: «Our cooperation with Fagor started in the 1990ies with the import of Spanish turning lathes. We have had a very good experiences with

Fagor controls over decades, both in terms of support and delivery times. The overall package is just right. Today, the CNC market has greater diversity than before, however the majority of the machines sold by us are still equipped with Fagor CNC systems. The digital displays (DRO) used by us are also from Fagor».

An appropriate Fagor CNC control is available for different types of applications. Their portfolio includes various systems, from high-end controls for 5 axis interpolation to medium performance categories and controls for simple turning and milling machines. ■

CNC-TECHNIK WEISS GMBH, NECKARTAILFINGEN

Custom grinding solutions

When Bernd Weiss talks about his entrepreneurial career, you notice how well focused he is into circular grinding. However, the 53-year old also knows exactly what he is talking about: his modular circular grinding machines have met the positive response of customers for over 25 years.

«Each machine constructed by me is precisely adapted to the type of the customer's workpieces and their processing requirements. This distinguishes me from competitors on the market», says Weiss.

Weiss' machines are all based on a modular system of different assemblies, which are built upon a machine platform as specified. The portfolio for instance includes 5 different workpiece headstocks, three different tailstocks and up to 25 different variants for the structure of the grinding headstock. A self-developed four-fold revolver for internal grinding, as well as the appropriate automation, if required, complete the range of offers.

Customers for these highly customized configurations are located all over the world, however at least 60% of them are located in Germany and in other German-speaking countries; the remainder is based in countries such as Russia, Hungary, Italy, Belgium and France. Prevalently contract manufacturers, automotive suppliers, tool engineers, special machine manufacturers, service providers and assembly manufacturers appreciate these custom solutions. Our own engineering office with four experts are in charge of the implementation of customer requirements. The control unit is also a Weiss product. Weiss acknowledges: «We have the machine beds and enclosures manufactured by third parties. There are very good suppliers locally. And the assembled control cabinets, too, are supplied by companies working to our specifications. And of course, the screens and measuring systems are purchased». In general, Bernd Weiss makes high demands and thus is delicate in the selection of suppliers. «I expect a similar

Bernd Weiss thinks with a customer orientation, and believes he has found the right partner with Fagor in every aspect.



attitude from people we work with as we with Weiss have it».

In regards to the measuring systems, Weiss searched for a perfect supplier for quite a while: «If you offer very individual machine solutions to your customers,

The people from Fagor offer customer-specific solutions if required - but they also are familiar with standards - for me this means that I can precisely get the right product according to my requirements.

but suppliers only provide «run-of-the-mill» solutions, you have to change your views in regards to the supplier». A friend, also an entrepreneur, put the name Fagor into play, whom Weiss had not known before. A meeting with Fagor

in Mondragon in 2007 finally convinced him. Both Fagor's practical orientation and the required connector compatibility combined with consistently excellent technical support, Weiss was convinced that Fagor was the right supplier.

«The people from Fagor offer customer-specific solutions if required - but they also are familiar with standards - for me this means that I can precisely get the right product according to my requirements», says Weiss.

And he adds: «At that time it was essential for me that Fagor scales had the best quality-price ratio with significantly better support and better consultancy».

Today, Weiss exclusively uses the entire Fagor measuring system program with rotary and angular encoders plus the digital displays. «I want to stay innovative for my customers. This is possible if you have the right partners», Weiss rounds off the good cooperation with Fagor. ■

The Smart FACTORY

Industry 4.0 is a term invented in Europe, describing the new factories and production systems where products, processes and users are connected and interact with each other. All this has been possible thanks to the great advances made in information technology. In North America, the most commonly used term is IIoT (Industrial Internet of Things) which refers to the same concept.

The industry is incorporating connectivity, digitization, information systems and high-performance interactive software's into its manufacturing processes. Thus making it possible to achieve production processes that are more efficient while offering customers greater flexibility, innovative and customized solution to enhance productivity and quality.

Fagor Automation is developing new integrated automation solutions that are tailored to Industry 4.0 and a manufacturing sector that demands productivity increases, greater efficiency, production versatility, resource optimization, simplification of processes, better safety and reduced energy consumption.

At Fagor Automation, we are aware that the fourth industrial revolution is already taking place and, therefore, our CNCs are already prepared.

Mobile Internet and M2M (machine-to-Machine) communication are the basis of Industry 4.0. Both offer the possibility to exchange information between systems and products, capture and analyze data, integrate different systems including remote services.

In the productive systems of Industry 4.0, the data flow of low level systems (sensors on a machine or process) is centralized at the highest possible level (the cloud), is processed and then converted into production orders (commands), maintenance or even fault



diagnosis and this newly processed data is returned to the drives to be executed.

The main players in these new factories are the Cyber Physical Systems (CPS), which compile data from the various connected sensors and manufactured products.

In a typical machine tool, one of the CPSs is the CNC. According to this diagram, the CNC is in charge of the following:

- Compiling data from the various sensors, either inside the CNC and drives or outside, such as accelerometers, power or energy meters, etc.

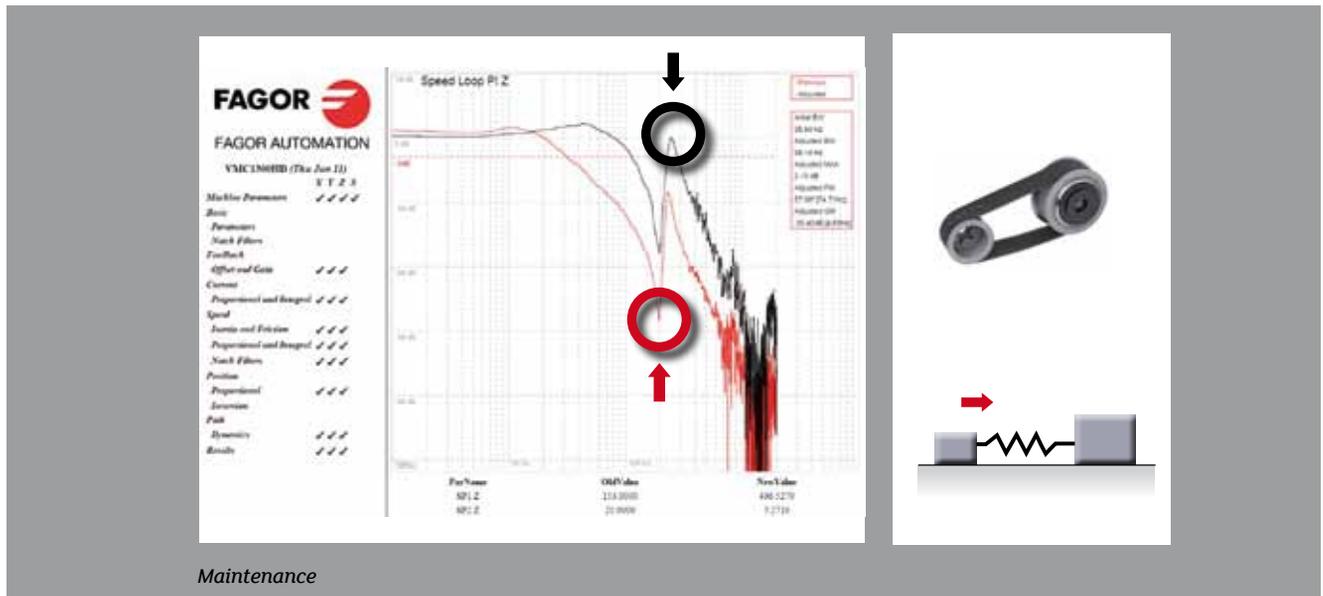
- Transforming all the data received to be processed later.

- Sending the data to the plant servers or to the cloud.

- Receiving instructions, programs and algorithms from the servers.

All these tasks can now be performed by Fagor Automation's CNCs. Utilizing the enhanced power of CNCs, an OEM/user can develop new Industry 4.0 features to increase the added value of their machines.

Some of the most promising possibilities that can be implemented are as follows:



Maintenance

New technologies bring added value to both the machine manufacturer and the end user.

Instead of following a periodic maintenance schedule, Condition-Based Maintenance uses all the information of the sensors to suggest that a component needs to be checked or replaced. In addition, since the CNC is an active system, periodic tests can be programmed to run machine test programs and collect information on power, alignments, accuracy, acceleration, vibration, etc.

In a typical machine tool, the Cyber Physical System (CPS) is the CNC.

This concept can be easily extended with the new communication possibilities that allow the safe transmission of test data to the cloud, enabling analysis by the machine manufacturer and planning of the maintenance stops, thus avoiding sudden production stoppages and the resulting loss in productivity of the machine.

In addition, the data of each specific machine can be added to the manufacturer's database. This allows the optimization of future predictive maintenance algorithms, achieved through collaboration. The intelligence

from the data jointly provided by various machines helps improve each one of them - each customer receiving an improvement in the productivity of their machines while sharing their data.

Troubleshooting

In the event that machine experiences a fault, all data previously provided by the machine, along with the last events recorded before the fault, is useful in resolving the fault in an optimal and efficient way thus reducing both the diagnostic and the machine down time.

Additionally, the combined experience of similar machines or components is available on the web can guide and assist the operators in resolving the incident. This data may help in determining the type of diagnosis to run (which can be accessed even from a portable device), provide solution to the problem or a direct contact to technical support.

A report on the current status of the machine and the tests performed can be simultaneously shared to expedite the solution.

Thanks to the new technologies, Fagor Automation's CNC 8065 will be able to develop new Industry 4.0 features.

Control and monitoring of energy consumption

Many of these functionalities may be developed with sensors already existing in a system equipped with a CNC and digital drives. In this case, information is provided on motor speed and power of the drives, making it possible to connect external devices to the CNC bus to measure the energy consumptions and provide information to the operator or plant management on real-time consumption data of the whole system.

Energy control from the CNC can be achieved by communicating with the PLC and optimizing the operation of various machine components based on the experience of other similar machines. The updated energy policies can be downloaded and integrated in to the PLC routines.

HMI

Advent of powerful smartphones and tablets allows access to information at all times. CNC 8065 with its widely open configuration can easily interact with such devices, hence information flow becomes seamless.

The future will unveil that a CNC will behave like HMI of various devices, that connects to remote servers to download data and algorithms or may even acts as data server for portable devices like tablets and smartphones. Accessing the data tables, editing programs and having access to all information from the CNC or associated peripheral will be possible anywhere, anytime. ■



FEEDBACK

System Novelties

Series 2 linear, Absolute Angular and Incremental encoders

The existing families of enclosed linear and angular encoders for CNC machines and high-precision applications have been redesigned, making way for series 2. The offer is also expanded with new models of angular encoders. In all cases, a wide range of connectivity options are available, with drive and control systems – the most complete in the market – using analog and digital interfaces.

The S2 and SV2 series have new side endcaps for the extrusion with a more attractive and modern design. The quality and performance of the linear encoder remains the same as before. The threaded head option is also available for these new models, offering different mounting options without the need for nuts, a feature already included in the G and L series and enthusiastically received in the market, as it eliminates the need for the manufacturer to have to use nuts.

In the SV2 series, the high vibration bar has been completely redesigned. The new, smaller bar can be mounted in smaller spaces, upper or lower access to fastening the linear encoder, while maintaining the performance and mechanical compatibility of its predecessor.

Finally, the G2 series models have a new, smaller head, while maintaining compatibility with the previous series. It should be noted that the reader head has two connectors and

air intakes at both ends. Hence, the connection cable and the air intake may be oriented in any direction without having to manipulate the reader head. The endcaps have been modified to adapt them to the design of the new reader head.

As for the re-design of the existing line of angular encoders, modifications have been implemented that affect the bodies of the encoders and the o-ring seals, with a new double-flanged design.

The threaded head option is also available for these new models, offering different mounting options without the need for nuts.

The result is the minimization of fluid accumulation by facilitating drainage and allowing wider assembly tolerances to achieve greater robustness and protection for work in hostile environments. The new line has full mechanic and electrical compatibility with its predecessor, making it possible to directly replace one model with another. In addition, in order to maintain the attractive image of the line, the external

aesthetics of the covers and bodies of the encoders have been modified.

On the other hand, this year the offer is extended, with two new models at the mechanical level:

I) an angular encoder with a 200 mm external diameter and a 100 mm internal diameter; and II) an angular encoder with a 87 mm external diameter.

In the case of the first encoder and following the lines of the current family, with a 200 mm external diameter and including all the improvements listed above, the 100 mm internal diameter model was developed. Given its uniqueness, it was necessary to implement the technology to integrate the rolling track within the encoder body itself. Thus, the main characteristics achieved, such as resolution of up to 29 bits and accuracy of 1 arc second, place this product in the forefront of the sector, with a very small offer available with these outstanding features. Altogether, the encoder contributes to expanding Fagor Automation's offer, providing greater flexibility in the machine or equipment design and offering an alternative for applications with a wide range of capabilities, in which only a few suppliers can be found;

III) the angular encoders with an external diameter of 87 mm have been designed according to the market trend, with integrated bearings and external coupling.

This angular encoder is specially designed for rotary tables and is aimed at flexography, lifts and industrial automation applications in general, reaching up to 23 bits of resolution in absolute models and an accuracy up to 10 arc seconds. The first available model will be with the coupling flange, absolute

The main characteristics achieved, such as resolution of up to 29 bits and accuracy of 1 arc second, place this product in the forefront of the sector.

with a 20 mm internal diameter. The line will be completed with another type of external coupling and different internal diameters will be available for both coupling types. The different variants will give rise to a wide family from a mechanical and electrical standpoint, to adapt them to the needs of different designs and applications. ■





Ultra-precision angular bench built by Fagor Automation and Fagor Aotek.

Fagor Automation strengthens its industrial base and

R&D in NANOMETRIC measurement

Fagor has created Equipment for angular patterns with a precision of up to 10 nanoradians.

Fagor Automation has positioned itself on the cutting edge of the nanometric precision measurement market with state of the art solutions.

The progress made has been developed by the construction of a machine that measures angular patterns and thus ensures «Precise measurements with nanometric repeatability» within the machines sensors.

Fagor Automation, through its Fagor Aotek Technology Center, has successfully culminated the design and construction of a machine to measure angular patterns on a nano scale.

Fagor is collaborating on the “Angles” Project with National European Metrological Centers, as well as Japanese and Korean centers, in order to engage in a cross-comparison.

The Project, carried out in collaboration with IK4-Tekniker and with the backing of the Guipuzcoa provincial council, has successfully produced one of the first machines in the world with «International system traceability»

making it a benchmark for pattern measurement and mass produced Angular sensors. In this same line of work, Fagor is collaborating on the «Angles Project with National European Metrological centers, as well as Japanese and Korean centers, in order to engage in a cross-comparison. This consolidates their role as an International metrology leader in this industrial segment.

For Fagor Automation, the measurement element must guarantee «Ten times the precision of the object being measured» which has led them to enter the scales nanometers and picometers. In fact, the machine measures, passing from the angular (second arch) to the linear (nanometer) scale, distances as small as «0.8 nanometers, which eliminates the uncertainty in 8 nanometer measurements». It is interesting to note, that 0.8 nanometers is approximately half the size of a water molecule.

The company's next challenges lie in replicating the model for linear patterns and encoders and achieving repeat measurements of as little as 2 nanometers.

The Fourth industrial revolution is popularity linked to the connectivity of machines and factories, but ensuring precision on a nanometric scale is an element that is just as crucial to ensure progress with guarantees towards the industrialization of «nano» elements and equipment, to support the change in this era within the science, aerospace, ICT and automotive industries, among many others.

Ensuring precision on a nanometric scale is an element that is just as crucial to ensure progress with guarantees towards the industrialization of «nano» elements.

Fagor Automation is one of only two European companies participating in the «JRP 58 Angles Project», which focuses its action on «remeasuring the radian» with an improved uncertainty of less than 0.01 arch seconds. ■

SERVICE

Connectivity and Traceability for

BIDIRECTIONAL SERVICE

A very popular trend in the industrial world in Europe is Industry 4.0 which includes machine connectivity, data collection and analysis for productivity enhancements and customized interfaces and software for digitizing the manufacturing world leading to smart factories.

Industry 4.0 offers various possibilities for monitoring and management of manufacturing processes. The primary purpose of this technology is to optimize production processes, improving efficiency, reducing costs and predictive maintenance. Another important aspect of industry 4.0 to be considered is the collection of large amounts of information on the materials, production processes and logistics used. And if we add quality connectivity to all of this, we achieve unit TRACEABILITY that will enable us to easily reach customers or end users.

Industry 4.0 enables us to unite products and service, and with it, expand our service offering: equipment maintenance, product improvements or evolutions and field equipment quality management. All of this can even be done remotely, which results in easy access and reduced times and costs.

But in order to make the implementation of these technologies possible, it is essential to have cutting-edge equipment in terms of digitalization possibilities, connectivity, specific software and performance. The implementation of these technologies will enable manufacturers and end users to work together to develop and apply Industry 4.0 and make the most of the advantages that this technology offers.

Fagor Automation products are on the cutting edge of technology and can serve a double purpose within a production process: recording large amounts of information with an infinite number of parameters, and at the same time,



enable connectivity and bidirectional remote access between the supplier and the customer. This will facilitate the transmission of the information needed to achieve such objectives as:

- Integrating an infinite number of sensors and measurement devices.
 - Integrating reader systems for traceability.
 - Recording continuous information on production and the status of the equipment itself.
 - Managing the information gathered locally or in the cloud.
 - Managing equipment efficiency indicators.
 - Implementing a MES platform or even integrating it in an ERP.
 - Monitoring your machine/factory in real time, either locally or remotely, from anywhere with an Internet or 3G/4G connection, etc.
 - Implementing unit traceability from the supplier to the end customer.
 - Implementing predictive maintenance, with early detection of malfunctions through the identification of fault patterns.
 - Implementing quality and maintenance management at our customer's own facilities.
- Etc. ■

EUROPEAN PROJECTS

Fagor Automation
participates
in the

WEEVIL

project focused
on the design of
an ultra-light,
ultra-safe electric
car for urban use

Fagor Automation participates in the WEEVIL project focused on the design of an ultra-light, ultra-safe electric car for urban use.

of vehicle's has been suggested as an effective alternative to remedy these concerns.

There are several electric vehicle alternatives currently on the market. In spite of representing an attractive solution, they possess shortcomings in terms of traffic congestion, safety and comfort.

The WEEVIL project, as part of the European Horizon 2020 program, has been proposed with the aim to develop a new concept of encapsulated electric urban vehicles with three wheels: Two in the front and one in the rear. This prototype means a qualitative leap forward for five reasons:

- Due to the vehicle structure manufactured from reinforced fiber, it is lightweight, yet safer.
- A mechanism that adapts to the width of the vehicle, thus enabling the vehicle to be parked in or travel through small spaces. Also improving the vehicle stability when traveling at faster speeds.

- A new, more efficient magnet-free motor.
- Interchangeable batteries.
- An esthetically and ergonomically meticulous design.
- It's capacity to transport 1 or 2 people, reaching a top speak of 90 Km/h, which enables the vehicle to safely travel on highways and motorways.

Fagor Automation's contribution to this project is based on the design of the control of the traction motor contained within the vehicle's powertrain. This controller has been designed for a switched reluctance motor with no magnets. It fully controls the motor, using the energy stored in the vehicle's 80V battery. The power output is 10 Kw. The Controller has been designed to be mechanically integrated into the vehicle's powertrain, along with the motor and the gearbox. This powertrain architecture offers a compact design that takes up a minimal amount of space within the vehicle. ■

In collaboration, 10 different companies from various countries are all working together on this 4 year European project that began on June 1st, 2015.

The primary goal of this project is to design a safe, affordable and comfortable urban electric car.

Pollution and traffic congestion have become the main threats to quality of life and health in urban areas. For this reason, the progressive electrification





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