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FAGOR AUTOMATION

Open to your world

MAGAZINE

No. 6 - March 2019 - Newsletter

MILLING TAILORED SOLUTIONS

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Alberto Fasana

Fagor Automation is a company with over 35 years of experience in the development and manufacturing of equipments for machine automation and control. Since ever, our product range has included CNCs for milling machines which have allowed us to gain a reputation for quality, reliability and performance. But in recent years this sector has been further strengthened with investments in product, performance and market development.

In a milling machine market scenario that includes a global import-export of about 1.9 billion euros, almost doubled if we consider internal consumption in the producing countries, and an average growth forecast of 6% for the next 3 years, we believe Fagor Automation's investments in milling technology are the basis of the success we deserve. A success that is strengthened day by day with a constantly growing market presence, with an increasing number of customers and machine tool builders, and with machines ranging from the simplest machining centers to complex multi-tasking milling machines.

When Fagor Automation chose to dedicate its MAGAZINE no.6 to milling solutions, I immediately understood that it would have been a difficult task: the greatest difficulty would have come from not having enough pages to describe all that our products can offer our customers in terms of range, services, performance, solutions and flexibility.

But then I remembered how our motto, «Milling Tailored Solutions», could help me. In a nutshell, it perfectly sums up the philosophy of our

Company. When a customer choose Fagor Automation, he can be sure that he will find a solution customized to his needs, whether it is a product, a service, or support to setup or use and program the machine. But how are we able to translate these words into reality? You can find the answer inside this magazine, but it is my goal to give you an outline.

A «tailored» product? You can find out how, thanks to a range of CNCs starting from the CNC 8060, upto the powerful CNC 8065, along with digital drives, motors and encoders, Fagor Automation is well suitable to equip the most simple as well as the most demanding machine.

«Tailored» performance? The control of machines up to 32 axes, up to 4 independent channels, up to 4 tool magazines, together with the control of combined mill-turning machines, and now also the hybrid (additives) is not enough? Then add also different programming languages, ISO, parametric, conversational and ProGTL3, all available in any CNC model. Let's also think about the most advanced milling performance, such as HSSA high-speed cutting, RTCP with standard and custom kinematics, head and table autocalibration, adaptive power control, solid 3D graphics, real-time collision and such a powerful i4.0 connectivity. A great range of features for our customers who can choose the most suitable options for their machines.

1.98 B €
Δ6%-3 YEARS

MILLING MARKET

«Tailored» services? Fagor Automation has a network of subsidiaries in 50 countries around the world which allow us to support our customers in any stage of the machine life. Starting from studying the most suitable equipment for the machine model, then supporting the commissioning of the machine, up to training the workshop programmers and providing customer service in the destination country where the machine is sold.

Where has this philosophy led us? Nowadays we can say, without fear of being proven wrong, that a Fagor Automation customer is not just a customer but, I would say more properly, also a partner, with whom we develop the best solution for his specific machine. To prove this fact, I wished to involve in this magazine some «testimonials»; to do that, the only difficulty we met was the lack of pages, that forced us to choose, between so many companies that are using our products with reciprocal satisfaction, some sample in order to display, at the same time, the variety of machines (by size and technology) and the countries where we operate.

It will be an interesting reading, get comfortable, let's start!

ALBERTO FASANA MANAGER OF MILLING TECHNOLOGY FOR FAGOR AUTOMATION HQ.

He's been working in Fagor Automation since 2010, when he started the Italian TAT (Technology Application Team), in Ivrea (TO-Italy), with the aim to developed the «Project Milling».
His career, all spent working in the CNC industry, allowed him to gain a deep experience in CNC business, mainly in the milling sector.

PACK MOLD

FAGOR PACK MOLD: selected technology that empowers you

Rui Orfao *is the Application Manager for Milling Technology at Fagor Automation HQ. He works at a one of Fagor Automation's Portuguese subsidiaries.*

For several reasons, mold production has always been one of the most complex tasks for a shop floor. First of all, it's almost always a unique piece and for this reason there's no room for any type of error, nor is there any time to make changes to the production process. Second, the quality of mechanization will affect not only the mold itself, but also every piece created by the mold. Third, with the continuous improvements in material science (new plastics, metals, resins, etc.) mold technology is constantly changing and adapting. Finally, competitiveness is forcing producers to always find new ways to reduce the time to market.

For all these reasons, from a company point of view, I would say that nowadays mold production must focus on achieving the best synergies, knowledge, technology and innovation. This means that relationships between mold manufacturers and suppliers are becoming more and more indispensable and only global companies focused around cutting-edge technology can make this is happen.

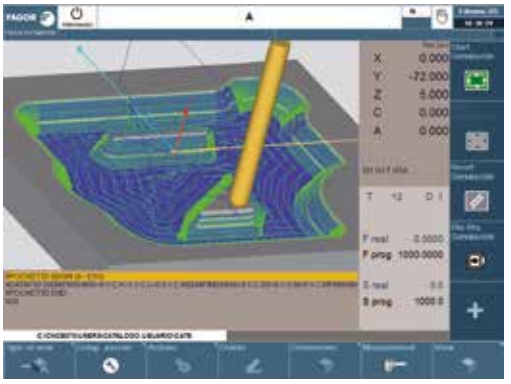
Our CNCs incorporate the latest hardware and software platforms: touch screen with an ergonomic interface, several programming languages, automatic kinematic calibration, 5-axis features, simulation with high-resolution 3D graphics, volumetric compensation, high-speed machining, and on-the-fly adjustments for dynamic behavior (acceleration, jerk)...

After mentioning all these developments, I'm proud to present the Pack Mold. On the one hand, it is a collection of features that are designed and optimized among each other to achieve the best results while, on the other hand, it represents a warranty of quality that the CNC is well configured to the highest standards required by the mold mechanization market.

Let me introduce these features one by one!

Simulation using 3D solid rendering graphics

One of the industry's future trends is the virtualization of the production process. The Fagor CNC simulator can replicate the exact environment that is mounted on the machine, as it's possible to load the very same configuration data taken from the machine. This tool is very powerful for different reasons. For instance, those in charge of programming the machine at the CAM or production levels can simulate the program with extreme accuracy, so as to reveal a wrong path or to evaluate production times. Moreover, this «virtual machine» can detect collisions and trajectory errors, as well as verify the dynamic behavior of the machine. Finally, the simulator can also load an STL with the geometry of the workpiece to be machined or save the STL resulting from the machining simulation for further analysis or documentation purposes.



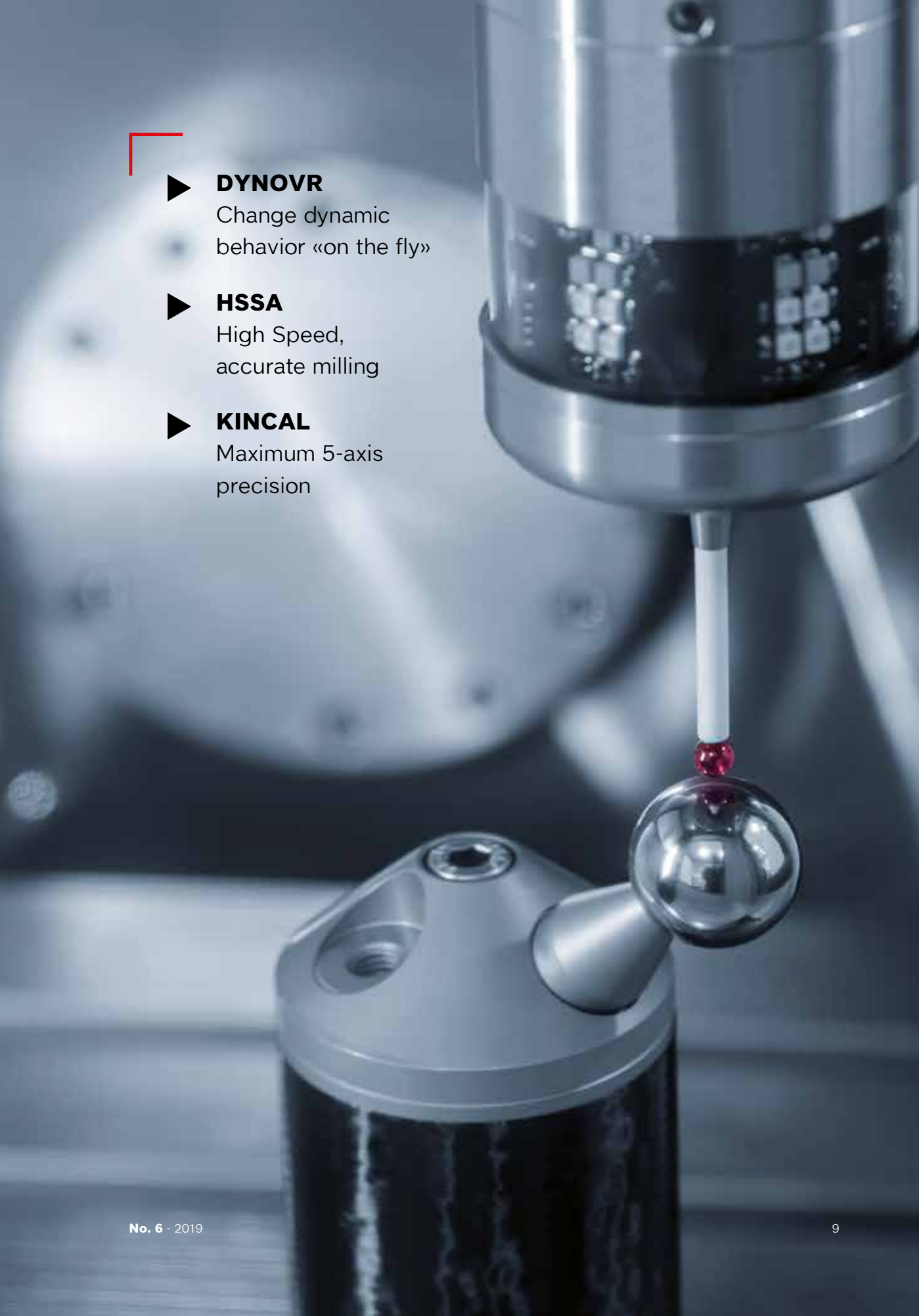
Kinematic auto-calibration

In 5-axis milling, all the mechanical errors are multiplied by a factor of between 2 and 10, due to the effect of rotary axes «amplify the movements». There's no way around this, apart from making the best possible calibrations, and as often as possible.

With the integration of KINCAL technology, the precision of 5-axis machining is guaranteed by simply running an automatic calibration cycle that uses a fast and safe process to calculate the geometric dimensions of rotary heads and tables. These values can be activated in order to find the best calibration taken just at the exact moment in which the machine will start the mechanization process. Moreover, the most recent development in this field is an advanced compensation method for non-linear errors that allows for best precision in rotary heads, as well as for hirth gear teeth.

High Speed Surface Accuracy - HSSA

Fagor's high-speed features are continuously improving. Besides the well-known HSSA philosophy, where the goal is to achieve the best dynamic performances and accuracy, pack mold includes several new algorithm tunings expressly made for mold milling. In addition, the CNC integrates the powerful DYNOVR (Dynamic Override), allowing for «on-the-fly» dynamic management adjustments during mechanization, meaning there is no need to interrupt the program. This is available by simply using a slider that controls acceleration, jerk and filters in a harmonious way to adapt them according to workpiece weight, hardness or the vibrations of the mechanization process.



- **DYNOVR**
  Change dynamic behavior «on the fly»
- **HSSA**
  High Speed, accurate milling
- **KINCAL**
  Maximum 5-axis precision

FMC

Best machining conditions

DMC

Reduce mechanization costs

Dynamic Machining Control - DMC

To maximize the performance of machine and tools, there is nothing better than the auto-adaptive feed control that pack mold offers as a DMC feature.

The CNC monitors the spindle power, in order to adapt the axis feed through an artificial intelligence algorithm. This always exploits the full cutting force borne by the tools without ever exceeding it. And the result? It never exceeds the maximum tool cutting conditions, slows tool wear, and reduces or prevents vibrations. In essence, it effectively maximizes the efficiency of the machining process, reducing milling times and extending tool and machine life.

Fagor Machining Calculator - FMC

Tool cutting data can be provided from a CAM system, tool supplier or based on the experience of a programmer. However, what do you do when none of these conditions are possible? In this case, FMC offers the programmer help!

The feature looks like a fully integrated «calculator of technological parameters» (feed and speed) that also estimates the cutting power of the mechanization process. Based on an integrated data base, a list of materials and mechanization operations, FMC allows the operator to choose both the best tool during the editing process and the best cutting parameters – all this is done quickly and simply – being useful for any of us with limited a technological know-how. Moreover, customers can populate the database with their own additional specific data when the technology requires customized materials, tools or operations. And the database can be exported/imported among all the workshop machines.

Connectivity Industry 4.0

For some years now we have been talking about the Fourth Industrial Revolution, coined Industry 4.0, which gathers together concepts such as the «Internet of Things», «Cloud storage and computing» and «cyber-industry». From a CNC system point of view, this means one thing only – connectivity. And the more open it is the better.

I have no doubt in saying that this is not really a «revolution» for Fagor Automation, but instead I'd say it's an «evolution». All of our systems – even the older ones – are already built for connectivity, which can't be said for the majority of our competitors.

Probably this is the field where better we respect our motto «tailored milling solution»: the CNC offers several connection protocols, as well as data storage/exchange methods, all included in the software. The customer is free to choose the most suitable for his application, that´s it, the CNC adapts to the shop floor, and is not the customer´s environment that needs to be changed because of the CNC. And of course we can provide pre-cooked solution with the new package «Fagor Smart Factory» ■

CONCLUSIONS

As far as I know, currently there is no other CNC in the market that can provide such a rich set of mold production features all in one package that meets the needs of any milling machine, from the smallest 3-axis machining center up to the most complex and large milling-boring machines.

No doubt to invite our present or potential customers to ask for this «Pack Mold» in their machine. Surely they will find out for themselves how Fagor Automation can make them even more competitive.

LAZZATI: AN IMPORTANT PLAYER IN THE HISTORY OF ITALIAN MACHINE TOOLS

LAZZATI is one of the world's leading manufacturers of large-size hydrostatic horizontal boring and milling machines; mostly 5-axis moving column machines with large dimension rotary tables and milling heads. The headquarters and offices are located in Rescaldina (Milan, Italy). A long tradition of mechanical production of exclusively large-size machines has endowed this company with a maturity and operational potential that have made it a major international market leader in the most prestigious sectors such as aerospace, automotive and energy.

80 YEARS
100% MADE IN ITALY

LEADING
LARGE SIZE HORIZONTAL
HYDROSTATIC & MILLING MACHINES

Mr. Rovai, in 2019 you will be celebrating LAZZATI's 80th birthday. It is a company that has been in operation since 1939 and that has always been producing high quality hydrostatic machine tools. How did you achieve such an important milestone and how do you plan to evolve in the near future?
We are globally recognized in the machine tool sector thanks to a long tradition of research and development for our quality and for high levels of technological development.

Our company was born and is located in Lombardy, in the north-west of Italy. Since the foundation, we have dedicated our efforts entirely and exclusively to the construction of machine tools, maintaining the highest levels of technical and quality standards.

Thanks to many years of activity we have gained the experience that allowed LAZZATI to become a leader in major international markets by specializing in large-scale moving column boring and milling machines suited and appreciated in the most demanding sectors ranging from automotive to aerospace, from energy to earth-moving and, of course, general mechanics. Our future will be guaranteed through continuous investments in research while, at the same time, we safeguard the technical and cultural heritage we have acquired along the way.

You have remained an Italian family-run company with 100% domestic production. How did you manage this 'Italian miracle'?»
The company is family-owned, that is quite common structure of Italian machine tool builder. The 'Italian miracle' came from the quality of our products, assured by our production process, mixed with selling strategy and customer support. We select the best components in the market, no matter whether they are produced in Italy or worldwide so as to fully integrate our company in the global market; some manufacturing steps of simplest parts of our machines are carried out externally by associated companies, while the most strategic aspects of the production are all carried out in-house. Only in this way we can control the most critical and delicate phases, and assure quality and performance of our products.

LAZZATI and Fagor Automation: a union that seems to work well! What do you think?
We are very satisfied with our collaboration with Fagor Automation. They can provide us with the CNCs and the motors, the drives and the feedback systems for our machines, as well as the absolute linear and rotary encoders for axes, heads and tables. Fagor Automation was a pleasant discovery for us and for those

> Fagor CNC has been appreciated for use in turning operations since ever: for us this ended up being a very strategic advantage»

customers who require a numerical control that permits on-the-unit programming simple and powerful the same time. Thanks to the ProGTL3, the latest programming language introduced by Fagor Automation, the 8065M Power CNC allows us to fully satisfy those users who require simple programming to create truly complex pieces.

But we cannot forget that the Fagor CNC has been appreciated for use in turning operations since ever: for us this ends to be a very strategic advantage. Often our machines are equipped with automatic head change, as well with a D'Andrea turning head and the possibility to use both milling and turning cycles provided by the CNC software, gives our customer the flexibility of having a mill-turn hybrid machine.

It seems that the LAZZATI and Fagor Automation philosophies have several common points, doesn't it?
The philosophy that LAZZATI has followed throughout its long tradition places the customer at the center of its world. So, in this sense, it matches well with Fagor Automation motto «Open to your world»: our products are nearly always tailored on our customer's needing, just like Fagor products and services are. Probably that explains well the reasons for the excellent results achieved with the installation of the complete Fagor package on our large-size hydrostatic horizontal boring and milling machines.

In conclusion, what are the characteristics of the Fagor CNC that makes the difference for you?

I would say that this CNC is appreciated by our customers for several reasons. But there are two prerogatives of the system that I would point out most. First the excellent functionality of the FCAS anti-collision system, which detects collisions already during programming and simulation phase, while it avoids collisions both during execution as well as in manual movements in JOG AXIS or MDI mode, slowing down axes feed, up to stop them near an obstacle.

The second is definitely the ergonomics and futuristic design and features of the HBH4 wireless handwheel, which allows the operator to approach the work area without dragging a cumbersome cable, and execute several operations almost like if he was in front of the CNC, like move axes, jog axes, execute MDI blocks, reference the axes and measure tool length. All these operations can be to execute remotely on the small touch screen: a great advantage for those who work on large-size machines like ours! ■

AWEA MACHINES BENEFIT FROM THE USE OF NEW PACK MOLD

AWEA Mechatronic Co. LTD, founded in 1986, is one of the largest and most dynamic machine tool manufacturers in Taiwan. It has earned its outstanding reputation in Taiwan and worldwide and, nowadays, is one of the few listed companies in stock exchange in the sector.

CONTINUOUS GROWTH

3 PRODUCTION PLANTS

OVER **100,000 m²**

VERTICAL MACHINING CENTERS

5 **AXIS** GANTRY MILLING MACHINES

Over the past 15 years, AWEA's production has grown tenfold and, in line with this success, it has expanded its facilities and broadened its global business network. Its head offices are located in the city of Hsinchu (Taiwan). There is also another production plant in Taichung and in 2014, has been inaugurated another factory covering 66,800 square meters in Suzhou (China). In total, there are more than 100,000 square meters destined to the manufacturing of a significant and wide range of products, including small 3-axis vertical machining centers, 5-axis milling centers with roto-tilting table and large 5-axis dual rotary head machines.

Awea is certified to comply the quality and safety requirements for international markets. It also made significant efforts to enhance its corporate social responsibility, with a special emphasis on environment protection, energy saving, education and social welfare.

Jason Lin, Sales Manager of Awea, states that «over the last two decades, we have experienced continuous growth due to the high demand of our products. This is a clear sign that we are doing things right. To manage this growth, we have developed a comprehensive management system combining research, design, production, assembly, testing, monitoring, sales and services.»

To keep up with this sustained growth, AWEA has invested heavily in the new Taichung plant, located in the Central Taiwan Science Park (CTSP). This plant manufactures vertical machining centers, among a wide range of other products and services. The plant in Hsinchu manufactures mostly large machines, including the 5-axis gantry milling machines with bridge structures, as well as horizontal drilling machines, «whose quality has been praised by buyers from all over the world» says Mr.Lin, adding that «AWEA has always strived to achieve the highest quality from its own production processes, choosing worldwide manufactured located in the most technologically advanced countries, able to provide us the best mechanical components and, of course, we adopt the same philosophy for electronic components».

That's why AWEA began its collaboration with Fagor Automation for the equipment of its machines. Fagor Automation supplies AWEA with CNC systems, DRO, servo drives and motors, as well as linear and angular feedback systems. This entire range of products has allowed AWEA «to satisfy the needs of the most demanding users in terms of performance and usability».

Fagor Automation introduced recently among its offer, the so-called Pack Mold: AWEA's Sales Manager's opinion about using it on milling CNC is that «it offers great advantages». According to Lin, this Pack Mold «bundles up a range of features derived from combining the 35 years of experience of Fagor Automation in designing

CNC with its latest technical developments. Summing up all these features, the CNC responds to customers and machines needs in highest-demand milling machining».

«The Pack Mold has helped AWEA to improve machines performance and productivity by intervening in various aspects: simplified and more powerful programming languages that turn to reducing program preparation effort; better milling speed that permits to reduce mechanization time, combined with more accuracy to achieve a higher quality level of the production processes,» says Lin.

Different markets have different demands and this means new challenges for Awea. Fagor Automation offers a wide variety of solutions for the different production needs of those markets (people doing small part series, high productivity processes, programs developed directly on the CNC or from the technical office…) Apart of the standard ISO code programming, conversational and interactive programming ways are offered to ease the way the operator develops the programs. The part programming time is significantly reduced. Additionally many tools will be offered by Fagor to check the program prior to the machining. Among these tools the 3D high resolution graphics must by highlighted since they offer very realistic solid representation of the resulting part before the machining process. It also offers the possibility to section the part to have a better view of the final result.

«The Pack Mold has helped AWEA to improve machines performance»

Going to the machining process, the high-speed milling algorithms of Fagor Automation can ensure high level surface and accuracy. Fagor Automation offers also interesting tools such as the Dynamic Override that allows the operator to fix issues during the real machining. This tool allows to modify the behaviour of the machine during accelerations and decelerations. For very heavy parts it will eliminate vibrations, maintaining the programming speed and obtaining shiny parts.»

Mr. Lin points out that, apart from all these features, same importance goes to the FMC (Fagor Machining Calculator): «we can always work under perfect cutting conditions thanks to the rich database of materials and processes already integrated in the CNC and the customer can even add his own specific technology. And, with the new self-adaptive feed control, the DMC (Dynamic Machining Control), the machine can work always in the best proper cutting power, changing feed and speed in order to keep milling conditions as close as possible to the ideal ones».

Finally, the RTCP auto-calibration cycles are very useful in achieving the utmost accuracy for 5-axis machined parts. The periodic calibration of heads and tables is essential, but without the proper functionality, it's a process that needs a long time and requires specialized professionals. Using the same words of Mr.Lin, «with these cycles, in a few minutes, FAGOR CNCs allow the user to make an accurate and quick calibration based on the actual and present conditions of the machine, the same that he is going to use to mechanize»

Edward Yang, *AWEA President*

Mr. Lin's opinion about the Fagor Pack Mold option is very positive: «At AWEA, thanks to the features that the Pack Mold carries on, we've noticed a significant improvement in the quality during our milling tests, together with the big advantages that we can see for our customers, especially for molds and the 5-axis parts production. This is just another testimony of how successful the alliance between AWEA and Fagor Automation has become. It has always given us excellent results, and it's getting better and better» ■

PRIMINER

For this interview, we are very pleased to introduce Mr. Jack Chen, Managing Director of PRIMINER Machine Tools Dongguan Co.Ltd, who will tell us about his company and give us his opinion of Fagor Automation's products and partnership

PRIMINER'S SUCCESS

OPEN EAR CORPORATE CULTURE

QUALITY MANAGEMENT SYSTEM

R&D PRODUCTION

Mr. Chen, could you please tell us more about your company?

The group PRIMINER Machine Tools was founded by a global team working in the field of CNC machine tools which had been manufacturing products for over 15 years. Nowadays, we produce CNC machining centers at a top price-performance ratio in four different locations around the world. One of the company plants is located near Hongkong in China, which is a major hub for our production capacity, and there is another in Indonesia. We also have offices in Taiwan and Germany, which is our strategic European headquarters, both of which provide Priminer with its global sales and service network. We are proud to rely on an international team of competent and highly motivated staff who are always open to new ideas. And our corporate culture reflects these same attitudes. Our management has always had what I'd call an «open ear», willing to listen to the opinions raised by all upper or lower ranked employees. We have and we put into practice a flat organizational structure, which benefits from everyone's experience.

In your opinion, where does PRIMINER's success come from?

Through the adoption a «Quality System Management» that follows international standards, a highly motivated team of specialists takes advantage of serial production and reliable top-level suppliers with global leading positions in their sectors; these are the pillars of our success. An open and results-oriented company culture throughout all levels is the basis for the consistent high-level reliability of our products. Only employees that have been regularly trained and that are involved in the development of the production process can fully understand any present and future requirement. For example, this is the case for our German and China teams where we offer an intensive and permanent exchange program between these two key locations.

It seems you pay particular attention not only to R&D, but also to the quality of the components, is this right?

This is very true! Of course, the mechanical and electronic design of machines is really very important. But then, the more you produce the more important overall quality becomes. We always do our best to control our own internal quality: for instance, we age every casted part of a machine for about 6 months to ensure maximum structural stability and we still have a production phase for the manual scraping of all surfaces that will affect machine precision and accuracy.

Also, for external components, we need a policy that can guarantee the same levels of quality.

We select our suppliers very carefully according to our own internal criteria. Reliability, quality

and prices are checked in detail. We are more interested in establishing a long-term partnership and build loyalty with our partners, instead of just being customers. We have found that these efforts are rewarding; in this way we can pass this advantage over to our customers.

Just to give you an idea, for our own machines, we assemble linear guideways made by Bosch Rexroth and Hiwin, coupling supplied by R+W Germany, ballscrews from Hiwin and Pmi, both global suppliers based in Taiwan, all of which provide our machines with high dynamic and accurate axes movements.

With regard to crucial components, what can you say about CNCs and Fagor Automation?

We are already thinking and planning for the future. A growing in-house R&D department, with experienced engineers, is developing our machine concepts which ensures that we are prepared for the upcoming trends in the machine tool business - we listen to the market. Flexibility of CNC controllers is a must for us and we only go with the market leaders. We don't compromise on anything!

For this reason, not so long ago, after long and thorough tests on performance and quality on its CNC package, we included Fagor Automation as one possible variant for our machines. There are several markets in which this CNC is the perfect solution for our customers. It brings together high-level features, both for 3 and 5-axis milling machines, and simplicity. What else can a customer ask for? Without a doubt, this is helping us to broaden our product offer and allowing our customers to improve their productivity.

Mr. Jack Chen,
Managing Director of PRIMINER

Which Fagor CNC feature comes to mind as the most interesting for your machines?

The answer is not an easy one. We have quite a wide range of machine types, from the simple 3-axis machining center, up to gantry/bridge types or 5-axis milling machines. So, during our tests, we explore the whole range of features that Fagor CNC can offer us for milling machine control. All gave us very good results, so, if I now have to choose one, it's going to be difficult. But, if you really push for an answer, I would say that the operation and programming features are really a competitive advantage of this type of controller. As a matter of fact, for other CNCs we could talk about the programming language, while for Fagor we can talk instead about programming features. The user can choose between various programming levels, starting with standard ISO codes and including probably the richest conversational language I've ever seen and the powerful ProGTL3 language that allows the definition of even 3D surfaces while using only a few G-codes. And all these languages can even be mixed together

> «The way a machine is built affects the way it performs»

inside the same program, for instance when defining different mechanizations where each is done in an optimum way.

For a company like PRIMINER, which operates within an international market and well prepared to attract further customers, the opportunity to offer our products with such a broad variety of programming languages is definitely an enormous added value, which allows us to offer our machines for various shop floors, for those that are programmed off-line through CAM systems and those that require a fully integrated programming environment within the CNC.

In conclusion, how would you describe your partnership with Fagor Automation?

If you have read our company's motto, it says «the way a machine is built affects the way it performs». In essence, this is what our philosophy is based on. We are convinced that this is more than just a business: quality is also an ethical commitment we provide for our customers.

In line with this approach, we have found that Fagor Automation is a company that shares the same business vision, in terms of its products, services and support. As time goes on, we have been forging a stronger partnership, where we can continue to keep offering improved performance, precision, quality and productivity of our machines ■

«80% of our customers come back to trust once more in our machines»

Xabier Mendizabal,
R&D Director of SORALUCE

SORALUCE
SETTING NEW STANDARDS

«AT SORALUCE, IT IS JUST NOT ENOUGH TO MEET EXPECTATIONS, WE MUST PUSH BEYOND THEM»

SORALUCE is a world leader in milling, boring and turning technologies. Over its 55-year history, it has made constant, innovative and groundbreaking contributions to engineering, positioning the company to become a reference in the sector.

Clear examples of this are its revolutionary DAS+® active damping technology available only on SORALUCE machines and the innovative VSET system for raw part alignment. SORALUCE is part of DANOBATGROUP, the machine tool division of the MONDRAGON Corporation, one of the most important European business groups.

SORALUCE is a company that continues to grow quantitatively and qualitatively, where it currently has one of the more comprehensive and advanced ranges of products and services in the market. The company stands above the rest because of its technical capabilities in customizing every product based on the specific needs of the customer, as well as the implementation of turnkey projects, designing and the creation of complete lines based on quality, efficiency and customer costs.

Xabier Mendizabal, R&D Director of SORALUCE, has stated that «SORALUCE has contributed to the developments of the machine tool sector over its 55 years of intense activity. To be successful and to be a reference company, it is just not enough to meet customer expectations, we must push beyond them. This means designing and manufacturing new products, offering «best in class» services, customizing solutions and leading the sector on a technological level. Also, we contribute to improving the productivity and profitability of every one of our customers.»

HIGH-PRECISION MILLING

OVER 2,900 MACHINES INSTALLED

CALIBRATION

THAT IS QUICK AND SIMPLE

FOR MACHINE KINEMATICS

This European brand has installed more than 2,900 machines, almost half of these are in Germany, which is one of the most demanding markets. Moreover, 80% of its customers come back to trust once more in the company's products, a sure sign of its know-how.

The most demanding and innovative standards

The R&D Director at SORALUCE, explained that the company is always committed to «incorporating the most demanding and innovative standards in our equipment, with the aim of ensuring the technological supremacy of our machines».

«Some of the most outstanding components and functionalities of our machines are the DAS (Dynamic Active Stabilizer), Adaptive Control, Ram Balance, 3D thermal compensation, Balancing System table, modular quill, DHC (dynamic head calibration) and its Accura Head extension are just to name a few. Many of these benefits are some of SORALUCE's proprietary and exclusive developments and have been patented, explained «Mendizabal.

The R&D Director at SORALUCE clarified that it is essential that their machines come with «a fully reliable CNC that provides absolute guarantees, one that we can use for high-precision machining. We are very demanding and because of this we are currently working exclusively with the top brands in the market and among these is Fagor Automation.»

Within the broad selection of SORALUCE machines, those used for milling and boring are becoming increasingly more relevant. These machines are always equipped with at least a double 90/45degree rotary spindle and quite often with other spindles that can be changed automatically.

«The growing demands of our customers wanting to achieve higher precision machining is a challenge, to which we respond accordingly with a package called «Accura Head». This package can quickly and easily calibrate the kinematics of the machine, which always allows the milling process to provide a high precision finish, even when the spindle and the tool are tilted,» explained the R&D Director of SORALUCE.

Mendizabal stated that «there is a very close collaboration between Fagor Automation and SORALUCE, as it is one of the most sort after brands for these types of machines. Fagor Automation provides us with a great competitive advantage since they offer all the equipment needed by the machine: rotary and linear encoders, motors, drivers and of course the CNC itself. Since SORALUCE manufactures

«55 years of intense activity has contributed to the developments of the machine tool sector»

high-tech machines, the Fagor model that we have chosen is the most powerful - the CNC 8065 Power.»

«Apart from controlling multiple axes and spindles, execution channels and managing combined machines, the user-focused features of the Fagor Automation CNC allow us to have a differentiated and robust offer compared to our competitors. Other functionalities that I would like to highlight are the various programming methods, their ability to manage highly realistic 3D graphics and their HSSA (High Speed Surface Accuracy) machining system,» mentioned SORALUCE's R&D Director.

«Due to the closeness and the strong collaboration with Fagor Automation over the many years, our global recognition has been reinforced worldwide for both of us. From SORALUCE's perspective, we hope to continue growing together and strengthening our partnership,» concluded Mendizabal ■

3State

FAGOR

FAGOR AUTOMATION

Open to your world

FCAS
REAL -TIME MONITORING AND COLLISION AVOIDANCE

Crash prevention avoids machine and pieces damages, prolonging life of all mechanical parts, and liminting machine´s downtimes.

As machine tools evolve, we are seeing more and more physical components being added to them. Meanwhile, production time is becoming every day more important for cost impact and time-to-market pressure. The machine set-up time can be relatively long for particularly complex operations, mostly when there are a large number of components moving at once, or when axes movements can generate collisions among the various machine parts. The conventional methods by which the operator monitors for possible collisions are not the most efficient in terms of time or process reliability. For this reason, the use of collision check software packages is continuously growing. These tools simulate the cutting process of the machine that executes the given program; but this means that the collision detection is the result of an off-line simulation process, done by a stand-alone system, and this simulation can be more or less close to reality depending on how accurate is the machine modeling, with respect to the real one. Moreover, the simulation is performed under certain machining conditions and when any of them changes (take as example the tool length, origin shift, etc..), then the simulation must be repeated.

To answer these needs, Fagor Automation has introduced the Fagor Collision Avoidance System (FCAS). The FCAS performs real-time monitoring for all of the machine components at risk of collision. This monitoring is performed not only during simulation process, before running the execution, but also in manual and automatic modes, and also during movements done in tool inspections (when the execution is suspended by the operator, in order to verify the tool's cutting conditions, often moving axes for their position and then, moving them back to the interruption point).

The FCAS operation is very easy. First, the machine is modelled by defining both the machine's elements, the physical connections between them, and the «collision rules» in order to define which parts can potentially crash with others. This solution allows even to manage polymorphic machines, that means machines where mechanical parts can be, for instance, be mounted/unmounted (take as example an automatic head change device). All this setup is done in a configuration phase, that means, by the machine tool builder.

Then, from the operator's point of view, the use is very simple. The monitoring can be activated or disactivated, depending from the desired way of operation, and when active, the axes movements are continuously monitored: any positioning that would cause a collision, cause the machine to slow down the velocity, up to stop the movement before the collision occurs.

One big advantage of the FCAS, compared to off-line systems is that it is available in all operating modes. That's very important, for

One big advantage of the FCAS, compared to off-line systems is that it is available in all operating modes.

instance, in manual mode where the movements are not written in the program, but axes are moved according to jog or handwheel commands. As well in this case the axes feedrate are monitored so that, if a collision between one or more components is about to occur, then the machine will stop using acceleration and jerk control. When the collision threshold has been reached, the FCAS does not allow axes to move in the direction of the collision. On the other hand, in automatic mode, each block of the part-program is monitored (in look ahead) to ensure that the machine will never run the risk to collide.

Of course, the FCAS can also be used via the simulation channel of the CNC, during program test before the real machining, or on an external PC running a Fagor CNC Simulator, providing a much faster off-line simulation. If the part-program contains a collision, the FCAS will prompt an error writing the block number that, in case of machining, would cause the collision, in order to permit a fast and easy reprocessing of the part-program.

No need to underlying how useful this feature can be: crash prevention avoids machine and pieces damages, prolonging life of all mechanical parts, and limiting machine's downtimes. ■

SERIES 3 ABSOLUTE LINEAR ENCODERS

Fagor Automation releases the new Series 3 absolute linear encoders. The ongoing process of developments has been due to the experience gained from the Series 2 and other new innovative features have also been implemented. These improvements and innovations have had an impact on all the technologies incorporated in an encoder, in terms of its mechanics, optoelectronics and software.

From a mechanical perspective, attention is immediately drawn to the S3 series reader head as it is small in size, which can be installed inside reduced spaces. The threaded head option has been kept for the various mounting options without the need to use nuts. This feature was already included in the previous series, which was enthusiastically received by the market, as it eliminates the need for the manufacturer to use nuts. The small-sized G3 series reader head is the same as its predecessor and includes electrical and air connectors on both sides, so either outlet direction can be chosen without having to manipulate the head.

Modifications have also been made to both the endcaps, incorporating small improvements in the design compared to the previous series. For example, those of the S3 series no longer have a fastening screw between the endcap and the aluminium extrusion. Extrusion geometries have also been modified by reinforcing various parts in order to improve the response to different frequency vibrations. For both cases, the elimination of the selectable reference mark models has been done to reinforce the walls of the extrusion. Given geometry of the G3 model, other sections of the extrusion have also been reinforced, such as the profile-to-machine fastening area, achieving a vibration resistance of 300 m/s^2 in a wide range of frequencies. Also, exclusive protective lips for these new families are standard additions on all models. Geometric optimizations have been made to allow for changes to the section of the profiles, although

New end caps design improving the robustness of the product.

Smaller reader head dimensions for more constraint spaces.

the main innovation consists in the use of a fluoropolymer that is highly resistant to hydrocarbons and other chemical agents commonly used for machine tools.

Also, the G3 fastening system visually stands out, where the TDMS TM system has been replaced with a specific flexible extrusion machining process in a longitudinal direction. Now it stands up to the performance required for changing temperatures, providing greater rigidity for the fastening between the profile and the machine, which also helps to improve its response to vibrations.

Improvements have also been made to the optoelectronic sub-assemblies essential for encoder performance in hostile working environments. Aspects regarding optical reading and the inclusion of proprietary technology embedded in the optoelectronics have been enhanced, resulting in a very significant improvement in their resistance to condensation arising from a combination of temperature and humidity. This environmental phenomenon can be produced under normal circumstances, although it is more likely to occur inside the encoder during periods of inactivity. Results have shown that this new technology exceeds the expected anti-condensation and anti-vapor capabilities, by minimizing their effects and achieving optimal encoder performance and operation.

For both families, there is a a broad range of available connectivity with multiple drive and control systems (the largest in the market), which has recently incorporated new digital communication protocols as standard features.

Overall, the new series S3 and G3 offer greater product protection against external factors, allowing for maximum performance in terms of accuracy and repeatability ■

The use of nuts four mounting the reader head is unnecesary.

Your machine with our products will perfectly perform under hostile working conditions.

5 AXIS TECHNOLOGY UNDER CONTROL

FAGOR

FAGOR AUTOMATION

Open to your world

www.fagorautomation.com

ENSA
PASSION FOR IMPROVEMENT

Ensa was established in 1973 for the manufacture of large components for the Spanish civil nuclear program. Initially focused on manufacturing and providing services for state plants, later the company had the necessary experience for its internationalization during the early eighties following the nuclear moratorium.

Currently, 70-90% of its production is destined to the international market. Due to its strong multi-system vocation, Ensa's equipment is presently operating safely and reliably in more than ninety nuclear power plants around the world.

How and when did you become acquainted with Fagor?
Our relationship with Fagor Automation dates back to the very beginnings of Ensa with the first machine equipped with its CNC, which gave us a competitive advantage in our market. Over the last 15 years, Ensa has entrusted in Fagor Automation and it has been adopted as its standardized CNC for its machines and it will continue to do so into the future.

How is ENSA positioned in its market/ sector?
Ensa encourages a «passion for improvement» and has the infrastructure, technology and a qualified team capable of achieving the highest standards in engineering, design, manufacturing and service provision in its field and sector.

Within its DNA there is a commitment towards R&D, to always strive to be at the technological forefront. It is involved in innovative projects for nuclear waste management and the development of nuclear fission and fusion energy, being the first European company to deliver a component for the ITER (International Thermonuclear Experimental Reactor)

What do you like about Fagor Automation?
There are many good reasons for choosing Fagor products.

Speed and efficiency of its technical service, together with an immediate response time and a high degree of professionality.

Its technological developments compared to other competitors. For example, the availability of very long absolute linear encoders, being much longer than those produced by any other encoder manufacturer.

An easy-to-use CNC with a very intuitive interface and programming languages. Workers find it very easy to use and it is easy to make adjustments and put a machine into service ■

Company: Ensa Group (Nuclear Equipment and Enwesa Operaciones).

Address: Factory - Avenida Juan Carlos I, 8. 39600 Maliaño. Cantabria, Spain.

Employees: Ensa - 460 and Enwesa - 332

Number of plants: 12.

Sector: Nuclear and thermal energy components and power plants.

Activity: Ensa is a multi-system supplier of nuclear components with national and international experience. Its components are manufactured using multiple technologies, including some of their own designs in accordance with the most demanding standards, regulations and requirements.

It has extensive experience in the manufacture of steam generators, reactor vessels, pressure switches, containers, fuel racks, headers, heat exchangers, etc.

It also offers customized solutions for nuclear power plants and other nuclear facilities from the beginning of operations to their final decommissioning, such as equipment supply, maintenance, repair activities and waste treatment.

Number of machines: 20

Number of machines with Fagor CNC and Feedback Systems: 13

The key machines for Ensa, such as the vertical lathes and boring machines, are equipped with Fagor numerical controls. All the boring machines, Innse 1, Innse 2 and Aries, as well as the machines at the Advanced Technology Center and including the auxiliary workshop (lathe Pinacho and Zayer). Finally, retrofitting (vertical lathe and milling machines) has already planned and will mount Fagor CNCs.

Customer service and collaboration represent the core values of the company, working extensively with customers for the entire design, manufacturing, and prototype development process. Socially involved in creating employment, Rapid Design is continually seeking individuals who are driven, energetic and enthusiastic about contributing their creativity to a cutting-edge firm.

RAPID DESIGN

Firmly convinced that «Our company can only be as good as our people», Rapid Design Group enables their employees to contribute to innovate the firm. «We want you to succeed, so we empower our employees in an environment that fosters collaboration - We promote personal and professional development, allowing creative individuals to share their design ideas while also learning from the expertise of others».

How and when did you become acquainted with Fagor?

The Director of Manufacturing at Rapid Design, Vitaliy Arabsky, had his first encounter with Fagor Automation when he was still working for another company in 2001. That company purchased a lathe equipped with a CNC 8055. It was love at first sight, because of the simplicity, reliability, capabilities and the support from Fagor. For this reason, when the new company was formed in 2011, Rapid Design invested in other machines controlled by Fagor CNCs, up to the latest investments.

How is Rapid Design positioned in its market/ sector?

In competitive markets, the first step is to realize that clients are experts in their field; accordingly, Rapid Design works with its clients through the entire design, manufacturing and prototype development to allow them to bring their tools to market. Customer service combined with a very open dialogue represents the core value of the company: for these reasons, Rapid Design has a great reputation as a supplier for the oil and gas companies.

What are the main reasons for choosing Fagor?

We like the simplicity with which we can create even the most complex profile cycles, directly on the CNC itself. This method is very intuitive and efficient.

Features that allow for optimum part finish are combined with Fagor Automation's exclusive IIP Programming (Interactive Icon-based Pages) Conversational Programming.

The interactive conversational programming method simplifies the process by allowing the operator to chose the operation based upon an operation associated ICON key. The operator simply enters in the data directly off the blueprint. This tool allows users with no prior CNC programming experience to quickly learn and perform operations. Fast and easy operation is also accomplished utilizing an easy pop-up browsing operation philosophy ensuring your navigation through the CNC capability is simple and straightforward. Custom browsing is also allowed in which you have the ability to filter the information the operators wish to utilize and hide other non-essential information. All generated code follows the ISO G-code format most are familiar with.

Our typical production process is: first create the product on Leadwell Turning Centers equipped with Fagor 8060 and 8065 CNC controls, then the parts are finished on high-performance Challenger MM-430 and MM-800 & Leadwell V60 Vertical Machining Centers. The Fagor CNC lineup is armed with a simple to use interface that allows manufacturers to quickly and easily take advantage of today's advanced technology. For part finishing, a host of performance features are available including Adaptive Real-time Feed & Speed control (ARFS) in which the CNC analyzes the machining conditions such as spindle load, servo power, tooltip temperature and adapts both the axis feedrate and the spindle speed for maximum machining performance to ensure a consistent part finish.

In conclusion, there are multiple reasons why we utilize the Fagor CNC. With it being simple and easy to use, it helps us reach our efficiency goals. All of our personnel like the controller, so there will be no changes. In addition, the support from their primary engineering team has always been amazing ■

RAPID DESIGN GROUP INC.
inventing success

Company: Rapid Design Group Inc.

Address: 7502 42 St, Leduc, AB T9E 0R8, Canadá

Employees: 35

Number of plants: 1

Sector: Engineering design and Manufacturing of tools for oil and gas industry

The company and its activity: Rapid Design operates in 14,000 sq.ft. facility and is focused on continual innovation in both engineering and manufacturing of downhole tools. Providing manufacturing, designing and consulting services for the oil and gas industry. Specializing in downhole drilling and completions, it uses state of the art technology to develop and produce parts in a timely and cost-effective manner.

Number of CNC machines: 23

Number of machines with Fagor CNC and Feedback Systems 15

IMA
INNOVATION, AWARENESS, ABILITY

IMA's mission is to invest in technologies that will improve the quality of life on the planet, reduce food waste, increase access to more effective drugs and allow greater respect for the environment.

IMA is located in the heart of Packaging Valley, the advanced mechanics and industrial automation cluster in Emilia-Romagna, Italy, and its philosophy is based on research and innovation. Since 1961, for more than 50 years the company has produced hi-tech automatic machines for the processing and packaging of pharmaceuticals, cosmetics, food, tea and coffee.

A solid Group made of solid companies
The Group has about 5,500 employees, of whom about 2,300 are overseas; it is present in around 80 countries, supported by a sales network made up of 29 branches (Italy, France, Switzerland, the United Kingdom, Germany, Austria, Spain, Poland, Israel, Russia, the United States, India, China, Malaysia, Thailand and Brazil), more than 50 agencies, and counts 39 production plants around the world.

How IMA has become a leader in its market?
Our leadership position is the result of significant investments in R&D and constructive dialogue with end-users and the Group's ability to expand internationally, conquering new markets. The IMA Group owns more than 1,700 patents and patent applications throughout the world.

When and how did you encounter Fagor?
IMA first came across Fagor CNCs not so long ago. The Italian CNC market was dominated for many years by a well-known Italian brand that has now disappeared. In 2011, Fagor set up a team of professionals in Italy and started its so-called «milling project» to develop specific types of performance that could expand the business in the milling market. When we knew about the opportunity to buy new machines equipped with the ProGTL3 language, and the possibility to reuse our CNC programs, as well as to reduce operator training on this CNC, we started to invest in machines with Fagor. Our choice was also confirmed as a good one when we found out that several of our suppliers had bought, or were about to buy, machine tools equipped with Fagor CNC.

Which are key reasons for choosing Fagor?
We have to say that Fagor is not an exclusive choice on our part: we need to be open to different brands, different machines and different technologies. Also because we have to exploit the particular characteristics that any particular brand can offer. But talking about Fagor, the most obvious advantage for us was the compatibility of ProGTL3 programming language with other CNCs, together with the ability to import and convert part-programs from other machines. But we soon discovered many other interesting feature: for instance, we were surprised by its powerful performances in 5 axis milling. Starting from automatic cycles to calibrate heads and tables, passing through 6 different choices for piece rotation, ideal for 3+2 axis milling, up to high definition 3D graphics that show not only the axis movements, but also how the part will result from the process. To conclude, we would say that we are very satisfied with Fagor CNC: its performances, together with the good technical support that the Italian subsidiary has always given us, definitely justify the choice that we made ■

Company: IMA S.p.A.

Address: Via Emilia, 428/442 - 40064 Ozzano dell'Emilia (Bologna), Italy

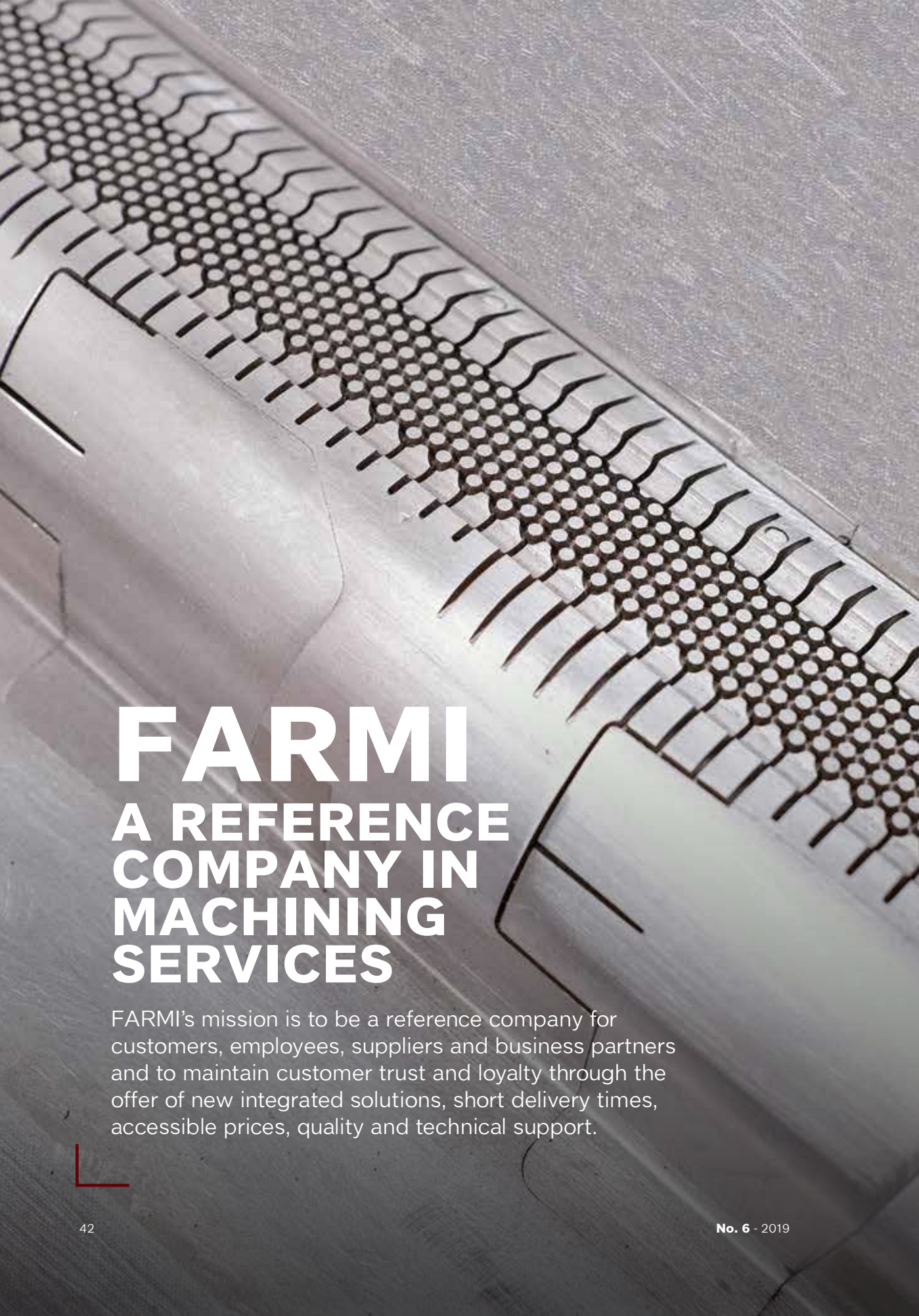
Employees: 5,500

Number of plants: 39

Sector: design and manufacture of automatic processing and packaging

The company and its history:
Established in 1961, IMA is world leader in the design and manufacture of automatic machines for the processing and packaging of pharmaceuticals, cosmetics, food, tea and coffee.
The first machine designed by IMA was for the packaging of powdery products into folded paper envelopes. In 1963 the Vacchi family purchased 52% of IMA, transforming it into a joint-stock company to promote its industrial growth.

IMA S.p.A. has been listed on the Milan Stock Exchange since 1995 and in 2001 joined the STAR segment; the Group closed 2017 with consolidated revenues of 1,444.7 million euros, and an increase of 10.2% over the previous year. Exports accounted for more than 88%.



FARMI

A REFERENCE COMPANY IN MACHINING SERVICES

FARMI's mission is to be a reference company for customers, employees, suppliers and business partners and to maintain customer trust and loyalty through the offer of new integrated solutions, short delivery times, accessible prices, quality and technical support.

Farmi is a well-positioned company in the mold sector, due to it capacity to work with large dimensions.

How and when did you become acquainted with Fagor?
The latest of our purchased machines are equipped with Fagor systems. It was a nice surprise to discover how this CNC can assist in our manufacturing processes. Some of these are deep drilling boring machines that are really indispensable in plastic injection mold production. Thanks to the combination of its state-of-the-art features provided by this control, together with the simplest operation and programming that we have ever seen on a CNC, we have managed to significantly reduce the time-to-market for our products.

How is FARMI positioned in its market/sector?
In the mold sector, FARMI ranks 49th in the list of the 50 largest mold companies, according to what was published by the magazine Molds & Plastics.
The repair of machinery and industrial equipment represents 70% of FARMI's turnover.
FARMI is a well-positioned company, due to it capacity to work with large dimensions.
FARMI tries to embrace diverse projects and avoid market oscillation, aspiring to be a pioneer in various metalworking sectors.
One of FARMI´s priorities is to find solutions for our customers, whatever the material may be, as long it's possible to work on their own machinery or their business partners.

What are the main reasons for choosing Fagor?
Farmi is deeply committed to R&D. The company participates in several European projects relating to process/project optimization and production innovation. Our relationship with Fagor Automation started through the purchase of machines equipped with its CNC and Feedback Systems, until it became a real partnership. Nowadays, it allows our engineers to access the latest available technologies focused on our processes.
For example, we were among the first customers to use the DMC (Dynamic Machine Control) features of the CNC. It consists in the axis feed adaptive control which depends on the power consumption of the spindle. With this technology, we have taken the utmost advantages in tool life and in machining time optimization. Besides this, while using the DMC, the CNC can detect when a tool starts to exhibit symptoms of wear by increasing the cutting force . In this case, the feed is automatically optimized in order not to go beyond the predicted cutting force.
Finally, it can also optimize tool start/stop movements, minimizing tool vibrations and, accordingly, minimize tool wear, prolonging its life and allowing costs savings on tools.
Summing up all these advantages, there's no doubt for us about Fagor technological supremacy when talking about improving our competitiveness and productivity ■

FARMI

Company: FARMI - Reparações, Lda

Address: Cova das Raposas, Zona Industrial de Pêro Neto, 2430-403 Marinha Grande

Employees: 49

Number of plants: 1

Sector: Mold making, Metalworking, Repairing and Servicing.

The company and its activity:
FARMI is a family owned company that began its operations in 1990.
The core business was the manufacture of accessories for the repair of machinery and industrial equipment. In 1997, the company opened its own production plant in Pero Neto, Marinha Grande. This change has led to the expansion of its operational areas, as well as the acquisition of more sophisticated equipment allowing for precision and accuracy in all its projects. FARMI is currently a Service Provider in the metal-mechanics and mold industry. Throughout its 29 years of experience, it has become a reference company in milling, turning, grinding, erosion and deep drilling services.

Number of CNC machines: 14

Number of machines with Fagor CNC and Feedback Systems: 4
Deep hole drilling is crucial in plastic mold manufacturing. Every drilling machine in the workshop is equipped with FAGOR CNC8065 systems, including some key milling machines for the manufacturing process.

ADDITIVE MANUFACTURING
COMMITTED TO INNOVATION AND TO NEW MANUFACTURING TECHNOLOGIES

From the first patents back in 1983 and until now, the Additive industry has been a part of what is called the «Fourth Industrial Revolution».

The constant rise in costs of raw materials and the need to create ever more complex structures have created the need to search for alternatives when making parts in a «subtractive» manner or by milling.

Since the beginnings of the additive industry, and by looking forward at the needs of its customers, Fagor Automations has the strategic goal of being at the forefront. It has invested in its R&D departments, created partnerships with Technological Centers and companies to develop special applications and to control variables used during this process (temperatures, material inputs, speeds, etc.). This has allowed us to be the only CNC manufacturer to be at FORMNEXT, the industry's most prominent trade fair in the world, held in Frankfurt, Germany.

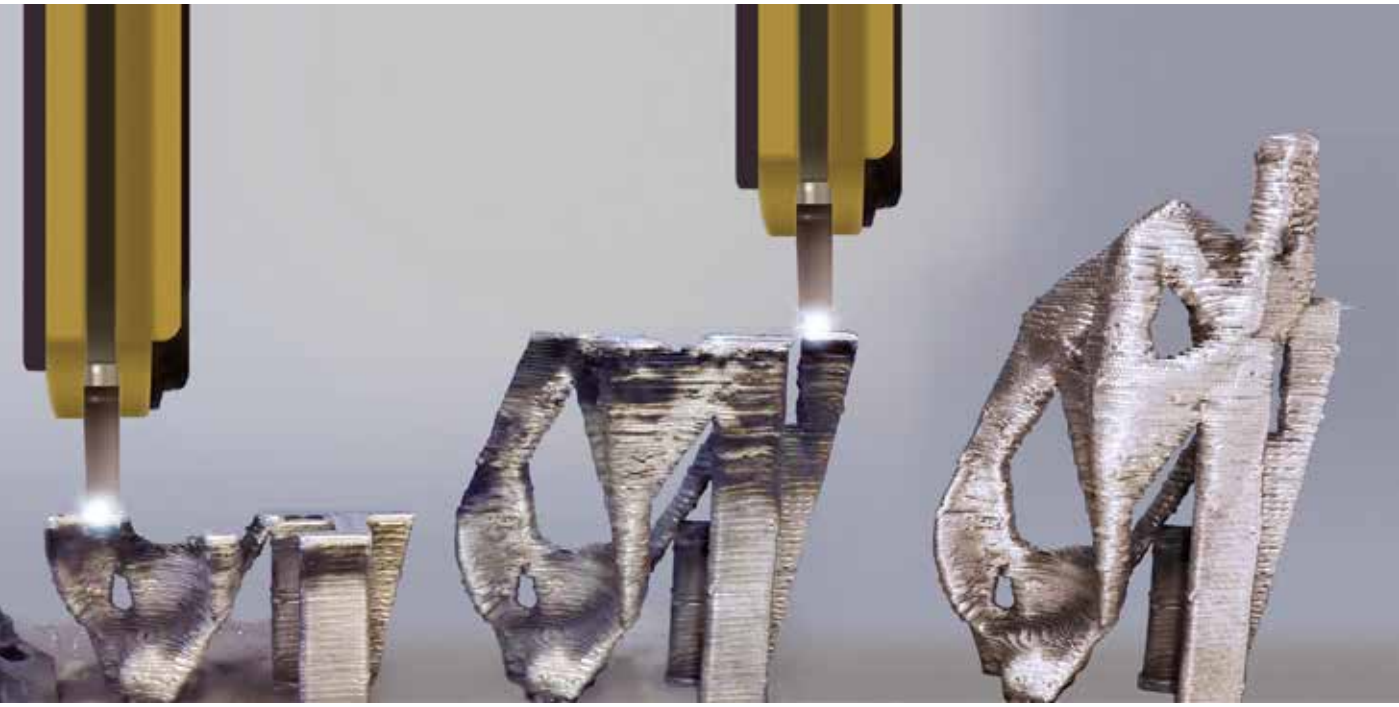
Since this is an industry undergoing constant developments, there is some concern about the models or types of machines that the market will require in the medium term, even though «hybrid» machines are the reason behind the investment of many well-renowned companies that utilize different technologies (LMD, SLM, WAAM, etc.). This is why Fagor Automation's CNC experience with systems that use various

cutting and material removal manufacturing processes and additive manufacturing capabilities make us the perfect partner in the sector.

The Additive Manufacturing Pack for the Fagor 8065 CNC is the most open system on the market, which can intelligently control and optimize manufacturing processes. Fagor CNCs can be easily configured for multitasking machines, which is often the case for most additive machines in the industry. Despite all the advantages of additive technology, an optimal surface quality has not yet been achieved for parts and this is the reason why many machines must incorporate milling technologies. After completing the additive process, in order to obtain the perfect part, the Fagor CNC will finish the piece using high-speed and continuous 5-axis machining algorithms.

Among the multiple functionalities incorporated in the Fagor additive pack, what stands out is its open system and multi-process support, technological tables for manufacturing process variable management, laser power control (analog or PWM) and closed loop process control

Over the upcoming years, subtractive and additive technologies will coexist as complementary processes for most applications. Fagor Automation is prepared to provide solutions to both technologies, either separately or for a combination of both ■



The Additive Manufacturing Pack for the Fagor 8065 CNC is the most open system on the market

www.fagorautomation.com

FAGOR AUTOMATION

Open to your world

Fagor Automation holds the
ISO 9001 Quality System Certificate and the
CE Certificate for all products manufactured.

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MONDRAGON
HUMANITY AT WORK
Finance Industry Retail Knowledge