# **SHAPE it**

OSG GLOBAL TOOLING MAGAZINE | WINTER 2025

### **TRENDS:** CUTTING SUPER ENGINEERING PLASTICS

On-site customer feedback from precision semiconductor resin part manufacturer leads to product development of SEP-EL end mill optimized for SEP applications

### SPECIAL FEATURE

OSG EX-CELL-O spline rolling machine aids global drive system manufacturer with CV joint prototype development in Mexico

### **GLOBAL REPORTS**

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Recaps from AMB 2024

### **EMPLOYEE INTERVIEW**

in France

# "Beyond the Limit 2027" – Striving to attain sustainable growth

### A Message from the President

The year 2024 was a year in which "quality," the foundation of manufacturing, was called into question, starting with data falsification of automobile certification in the Japanese automotive industry and the report of fraudulent quality inspections of Boeing's main aircraft in the aerospace industry. In the automotive industry, the trend toward electric vehicles (EVs) has begun to show signs of decline, but new EV manufacturers, led by China's BYD, have emerged, bringing about changes in competition, especially in China and Southeast Asia, and affecting the supply chain.

In this business environment, OSG has launched a new 3-year medium-term management plan "Beyond the Limit 2027" from fiscal year 2025 to fiscal year 2027. OSG will continue the efforts already underway in the previous medium-term management plan, such as improving profitability and business efficiency, and aiming for a 40 percent global share of its main product, taps, and will further concentrate on developing growth industries for micro precision processing, which is a key focus of the company. In July of last year, Contour Fine Tooling B.V., which has a wide range of sales channels in the lens industry, joined the



OSG Group through M&A. In September 2024, Micro Diamond Corporation was also acquired by the OSG Group. In December of the same year, Nissin Diamond Co., Ltd., a group company of OSG, has changed its name to OSG Diamond Tool Co., Ltd. Through these initiatives, OSG is comprehensively strengthening its diamond tool business, gaining new sales channels that were previously unavailable, such as spectacles, contact lenses, intraocular lenses, and optical lenses, to further expand sales of its products in the field of micro precision machining.

In terms of new product, OSG has released "Green Tap (GRT)," a high-performance and low-carbon forming tap, in conjunction with the Japan International Machine Tool Fair (JIMTOF 2024) held in November last year. In today's era where efforts to reduce CO<sub>2</sub> emissions in manufacturing processes are becoming increasingly important, OSG will contribute to the realization of a carbon-neutral society by providing customers with added value that goes beyond performance and quality.

Finally, I hope that 2025 will be a great year for all readers of SHAPE it.

Nobuaki Osawa President & COO of OSG Corporation

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## **Cutting Super Engineering Plastics**

On-site customer feedback from precision semiconductor resin part manufacturer leads to product development of SEP-EL end mill optimized for super engineering plastic applications

Akinori Sumi, Koichi Ida & Shotaro Noda OSG Corporation



### **Super Engineering Plastics**

In recent years, the semiconductor manufacturing sector has taken steps to advance the use of super engineering plastics (SEPs). SEPs are high-performance plastics with properties that can withstand high temperature and tensile strength. Equipped with exceptional thermal and mechanical characteristics, SEPs excel even in harsh environments. In many cases, SEPs can effectively replace metals as they are lighter in weight. Today, SEPs are commonly employed in electronic appliances, home electrical appliances, automobile, medical instruments, airplanes, industrial machines, and more.



From left, OSG sales representative Koichi Ida, Mori Craft plant manager Takeshi Tamura, OSG application sales representative Akinori Sumi and OSG applications engineer Shotaro Noda pose for a photograph at Mori Craft's manufacturing facility in Gunma, Japan.

### **Cutting Resin**

Firstly, most of the plastic products that surround us today are made by injection molding, not cutting. Because resin has a low melting point, injection molding, which involves pouring molten plastic into a mold and shaping it, is the most efficient method for mass production and has the least material loss. However, since the production of molds is very costly, it is not suitable for small-lot, high-mix production. It is said that cutting can reduce costs for part production quantities up to about 700 pieces.

In addition, some resin materials have very poor fluidity when liquefied, and many are only available as plates or bars due to their manufacturing methods. These materials have no choice but to be cut, so there is a certain demand for cutting resin.

### **Machinability of Resin**

The mechanical properties of SEPs are significantly different from those of metals, and the performance required of cutting tools is also different from that of metals. General resins have different characteristics than metals in various ways, such as being softer, more stretchable, having lower thermal conductivity, and lower heat resistance. The points to be careful of when cutting are also different from metals, and cutting resin requires unique techniques.



Figure 1. Comparison of bending moment in different materials using the same tool and cutting condition.

The main problem with cutting resin is not chipping or wear of the tool, but burrs, warping, and expansion and contraction on the workpiece. As depicted in figure 1, the cutting resistance of resin is quite small, about 1/20 that of metal, so abnormalities on the tool are unlikely to occur, but various problems can occur on the workpiece.

Additionally, in the case of transparent resins, a highly transparent surface is required, and a processing method that is appropriate for the resin material is vital. Furthermore, some resins contain reinforcing materials such as glass fiber and carbon fiber. These materials can cause significant tool wear during processing. When the tool wears and the cutting edge becomes curled, the cutting ability decreases, leading to increased burrs and deformation, so even slight wear is not tolerated for cutting tools used in SEP processing.



### **Cutting Tools for Resin Processing**

Currently, the majority of end mills for resin processing sold by tool manufacturers are positioned as end mills for acrylic. End mills for acrylic are generally uncoated and have a strong rake angle to improve sharpness. However, since these end mills are designed to be almost wear-free, they quickly wear out when processing fiber-reinforced SEPs, and are incapable of meeting quality requirement.

Diamond coating is the most effective way to improve the wear resistance of SEP processing. However, diamond coating has a large film thickness and the cutting edge tends to curl, making it difficult to maintain sharpness, so it cannot be used in applications that require high precision. Furthermore, diamond coating products are also more expensive than general tools, making them less attainable.

### Mori Craft – The SEP Application Expert

To better understand the usage and machining challenges involving SEPs, OSG consulted with Mori Craft Co., Ltd., a company that specializes in precision resin processing.

Founded in 1991, Mori Craft is a metal and high-performance plastic solution provider. Using some of the latest precision processing technologies, Mori Craft supports its clients' product development from prototype to modeling. Mori Craft can perform processing with an accuracy of  $\pm 0.01$  mm and offers solutions for mass-produced parts, small-lot, as well as multi-variety products. The annual production volume of parts may vary from 10 pieces to more than 36,000 pieces. The volume of each batch may range from a single piece to 3,000 pieces. In terms of size, workpieces may range from 5 mm by 5 mm up to a maximum of 70 mm by 120 mm. Although requirements vary depending on the client, the precision requirement is usually around  $\pm 0.02$  mm. Currently, the company's main products are test sockets, which are inspection jig components for the semiconductor industry.



1. From left, Mori Craft plant manager Takeshi Tamura shares his insights revolving the processing of super engineering plastics with OSG representatives.

2. Mori Craft's inspection room. Mori Craft has obtained the ISO 9001 certification since 2023, a proof that its products and services are provided under a quality control system at an international standard level.

3. Staff from Mori Craft's sales order management department.

Employing 17 staff, Mori Craft's manufacturing plant is located in the city of Tomioka, Gunma, Japan, with an estimate production area of 384-square-meter. Its production facility is equipped with a variety of machining centers, including a Roku-Roku Sangyo MEGA-S micro machining center (HSK-25), a DMG Mori CMX 800 V vertical machining center (BT40), a Mori Seiki DuraVertical 5060 machining center (BT40), and 12 FANUC Robodrill compact machining centers (BT30). Mori Craft has obtained the ISO 9001 certification since 2023, a proof that its products and services are provided under a quality control system at an international standard level.

OSG first visited Mori Craft in May 2022 by the introduction of cutting tool distributor Sato Kiko Co. Ltd. Mori Craft has been manufacturing SEP products since the company's founding more than 30 years ago. As an expert in SEP applications, Mori Craft Plant Manager Takeshi Tamura shared his insights revolving the processing of this material. "There are many kinds of resins, and among them, materials classified as super engineering plastics (SEPs) are very expensive, hard to obtain, and very difficult to cut due to their material properties," said Tamura.

"Above all, the durability of cutting tools used for processing SEPs is extremely poor," Tamura adds.

There were many malfunctions due to tool wear and chipping, as well as noticeable time lost due to accuracy inspection and tool replacement. Mori Craft has always been troubled by the limited cutting tool options for the processing of SEPs. Up until recently, the company would use a competitor tooling series specialized for machining copper alloy with DLC coating. The competitor tools are available in small diameter sizes and are inexpensive. However, Mori Craft has been dissatisfied with the tool life and processing quality.

### **Prototype Tool & Test Cut**

With valuable feedback and cooperation from Mori Craft, OSG conducted cutting tool trials on SEPs for approximately nine months, from May 2022 to February 2023. Two prototype end mills were developed in 1.5 x D length of cut and 3 x D length of cut.

The test part was a tray made of Krefine PEI. The processing involved plunging into the solid surface in Z direction, followed by milling at a depth of 1.8 mm to create a pocket. An OSG diameter 3 x 4.5 length of cut (1.5 x D) prototype DLC coated end mill and a competitor diameter 3 x 10 x 6 length of cut DLC coated end mill were used for the testing. The cutting trial was conducted using a FANUC Robodrill compact machining centers (BT30) with coolant emulsion (20 times diluted).

For plunging, the tools were tested at a cutting speed of 5,000 min<sup>-1</sup>, a feed rate of 200 mm/min, and at an axial depth of cut (ap) of 1.8 mm. Both tools ejected elongated cutting chips. For pocket milling, the tools were tested at a cutting speed of 5,000 min<sup>-1</sup>, a feed rate of 200 mm/min, an ap of 1.8 mm, and a radial depth of cut (ae) of 3 mm. For the pocket milling process, cutting began with slotting, which subsequentially turned into contouring at a radial depth of cut 3 mm. Since the radial depth of cut is the same as the slotting process, the cutting resistance has a tendency to rise, and the tool deflection also tends to increase.



Figure 3. Visual reference of approximate shape and dimensions of the test part made of Krefine PEI.

The competitor tool was able to complete pocketing two workpieces (milling distance of 2.3 m). However, the bottom of the pockets exhibited cracks and galling also occurred. The OSG prototype end mill, on the other hand, was able to complete pocketing 15 workpieces (milling distance of 17 m). Although there were stripes and chattering on the bottom of the surface, they do not affect the quality of the product. The OSG prototype tool exhibited normal wear and can continued to be used depending on the required machining precision. At the end of the trial, OSG's 1.5 x D prototype was able to achieve more than seven times the durability versus the competitor tool in Krefine PEI, demonstrating the superiority of the tool's cutting edge geometry and the DLC-IGUSS coating.



With this cutting trial success and the tremendous support from Mori Craft, the OSG product development team went on to standardize the prototype tool, which would become the SEP-EL, DLC-IGUSS coated carbide end mill optimized for super engineering plastic applications.

From left, OSG application sales representative Akinori Sumi and OSG sales representatives Koichi Ida explain the features of OSG's SEP-EL DLC-IGUSS coated carbide end mill to Mori Craft plant manager Takeshi Tamura.

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### **Key Features & Benefits of SEP-EL**

The SEP-EL is OSG's latest milling innovation specialized for high-quality processing of SEPs that are prone to wear. The first key feature of the SEP-EL is the application of OSG's original DLC-IGUSS coating, which has a film thickness of approximately 8 µm. Thicker than conventional DLC coating but thinner than typical coatings for steel, the DLC-IGUSS offers the perfect balance of lubricating effect, wear resistance, and cutting edge sharpness.

As depicted in figure 4, a second key feature of the SEP-EL is its 3-flute specification, which reduces the load on the cutting edge compared to 2-flute configuration. The low helix geometry of

the flute suppresses the generation of burrs, lifting or peeling of the workpiece when fixed with double-sided tape, resulting in stable processing. The 3-flute and sharp cutting edge specification enables high-speed and high-efficiency processing of various SEP applications.

Last but not least, the sharp cutting edge configuration of the SEP-EL reduces heat generation and enables high-guality resin processing. With excellent sharpness, general-purpose plastics, engineering plastics and SEPs can be cut through with a single stroke.



Figure 4. SEP-EL DLC coated carbide end mill for super engineering plastics.

### **Cutting Data**

A cutting test was conducted in a resin called Unilate to compare wear on the cutting edge and the machined surface between three tools an end mill designed for machining aluminum, an end mill designed for machining steel, and the SEP-EL.

As illustrated in figure 5, after milling 60 m of Unilate, the SEP-EL exhibited significantly slower progression of wear and has the least amount of burrs on the machined surface versus the other two end mills.

It is true that resin is a soft material and can be processed somehow if time to spent on deburring and annealing. However, considering the increasing precision and demand for resin parts in the semiconductor manufacturing industry, the need to improve efficiency of SEP part production is evident.

"After adopting SEP-EL, running costs improved significantly, which greatly contributed to improving productivity," said Tamura.

"This experience also helped our staff foster a professional mindset by emphasizing on the importance of proper tool selection," Tamura adds.

OSG always strives to deliver optimal cutting tool solutions for the ever-changing manufacturing industry. Through research, development and strategic collaborations, OSG will continue its journey of innovation to expand its offering of highly productive, energy efficient and environmentally friendly products.









Condition of Machined Surface after Milling 60 m





Figure 5. Cutting edge and machined surface conditions after milling 60 m of Unilate.





### About Mori Craft Co., Ltd.

Founded in 1991, Mori Craft is a metal and high-performance plastic solution provider. Using some of the latest precision processing technologies, Mori Craft supports its clients' product development from prototype to modeling. Mori Craft can perform processing with an accuracy of ±0.01 mm and offers solutions for mass-produced parts, small-lot, as well as multi-variety products. The annual production volume of parts may vary from 10 pieces to more than 36,000 pieces. The volume of each batch may range from a single piece to 3,000 pieces. In terms of size, workpieces may range from 5 mm by 5 mm up to a maximum of 70 mm by 120 mm. Although requirements vary depending on the client, the precision requirement is usually around  $\pm 0.02$  mm. Currently, the company's main products are test sockets, which are inspection jig components for the semiconductor industry.

Mori Craft performs resin processing using lathes and machining centers. With the introduction of 3D CAD, the company now also processes complex three-dimensional shapes. In particular, Mori Craft is an expert of cutting high-performance SEP products. For resins, the company actively proposes conductive and antistatic materials and ideas for improving processability. For metals, it mainly processes aluminum, brass, SUS, etc., mainly for circuit inspection parts, and can also accept various surface modifications.

Employing 17 staff, Mori Craft's manufacturing plant is located in the city of Tomioka, Gunma, Japan, with an estimate production area of 384-square-meter. Its production facility is equipped with a number of machining centers, including a Roku-Roku Sangyo MEGA-S micro machining center (HSK-25), a DMG Mori CMX 800 V vertical machining center (BT40), a Mori Seiki DuraVertical 5060 machining center (BT40), and 12 FANUC Robodrill compact machining centers (BT30). Mori Craft has obtained the ISO 9001 certification since 2023, a proof that its products and services are provided under a quality control system at an international standard level.



Scan for Mori Craft's Official Website (Japanese Only)

### **Precision Processing Work Examples**

From left, a part made of PEEK and parts made of PAI. Mori Craft can perform processing with an accuracy of  $\pm 0.01$  mm and offers solutions for mass-produced parts, small-lot, as well as multi-variety products.









1. Founded in 1991, Mori Craft is a metal and high-performance plastic solution provider. Using some of the latest precision processing technologies, Mori Craft supports its clients' product development from prototype to modeling.

2. Mori Craft's operator prepares for the machining of parts.

3. Mori Craft employees pose for a photograph at the company headquarters in Tomioka, Gunma, Japan.





From left, OSG Royco Applications Engineer Omar Albarrán, OSG Royco Sales Representative Ana Karina Regalado, GKN Automotive Prototype Engineer Juan Soledad and GKN Automotive Prototype Manager Ricardo González pose for a photograph at GKN Automotive's manufacturing facility in Celaya, Guanajuato, Mexico.

## **Rolling Solutions**

OSG EX-CELL-O spline rolling machine aids global drive system manufacturer with CV joint prototype development in Mexico

**Omar Albarrán and Ana Karina Regalado** OSG Royco

Constant-velocity joints (CV joints) play an essential function in every automobile. They are responsible for providing a constant velocity of rotation, regardless of the angle at which the drive shaft is operating. Quality CV joints contribute to a smoother, quieter ride, and directly affect a vehicle's performance as well as safety.

Initially founded in 1759 and headquartered in London, England, United Kingdom, GKN Automotive is a global leader in drive systems. It is the world's first and largest producer of CV joints, which the company began manufacturing in the 1960s and diversified into the automotive industry. GKN Automotive's technologies and innovations made front-wheel drive cars possible and all-wheel drive systems more efficient, paving the way for the development of its high-performance eDrive systems. According to GKN Automotive, the company develops, builds and supplies driveline systems and ePowertrain technologies for 90 percent of the world's automotive companies. Its key products include sideshafts, CV joints, driveshaft boots, propshafts, suspension springs, steering components, eDrive systems, and more. GKN Automotive currently employs more than 25,000 staff worldwide, has 48 manufacturing sites and six technology centers in 21 countries to ensure customers benefit from local supply chains and world-class technical support.



Assemblies of CV joints at GKN Automotive's manufacturing facility in Celaya, Guanajuato, Mexico.
 An operator uses a machine to assemble CV joint components at GKN Automotive's manufacturing facility in Celaya, Guanajuato, Mexico.

### **CV Joints & Cold Forming**

GKN Automotive manufactures an array of CV joints, such as ball plunging joint, fixed ball joint, SX countertrack joint, tripod plunging joint, and more. All CV joints require a rolling process to produce splines on the shafts. The splines are produced by cold forming (also known as cold roll forming), which is a high-speed forging process that plastically deforms metal at near room temperatures. It is a fast, precise, and automated process that produces a large amount of metal components without removing any material. Cold forming requires heavy equipment and is ideal for large volume manufacturing.



From left, two CV joint drive shafts and a half shaft.



After rolling, splines are formed on the shaft.



GKN Automotive's manufacturing facility in Celaya, Guanajuato, Mexico.

### GKN Automotive in Celaya, Guanajuato, Mexico

Recently, GKN Automotive's prototype team in Celaya, Guanajuato, Mexico was seeking for rolling solutions for its prototype production involving CV joints. GKN Automotive's Celaya plant was originally founded in 1979. The name of the plant was changed to GKN Driveline in 2005. GKN Automotive's Celaya plant has an estimate production area of 4,500-square-meter and employs approximately 2,115 staff. CV joints are the main products at this site, which are produced by around 80 rolling machines at the plant. These rolling machines, however, are strictly used for manufacturing, not for making prototypes.

One of GKN Automotive's goals is to activate the prototype market in Mexico. However, unable to use rolling machines at its own facility, GKN Automotive's prototype team searched for a rolling supplier all over Mexico that would handle rolling processes outside of regular production.

"We looked for companies who had machines, who sold machines, and we found OSG," said GKN Automotive Prototype Manager Ricardo González.

OSG began the manufacturing and sales of rolling dies since 1956. Today, the company offers a broad lineup of dies and thread rolling products including cylindrical dies, flat dies, trim dies, planetary dies and rack dies. OSG is one of the world's largest manufacturers of rolling dies, with more than 70,000 cold forming tools being produced annually through several production sites in Japan, the United States, Mexico, Germany, China, Taiwan, Korea, Thailand and India.

GKN Automotive's first communication with OSG Royco in Mexico was about rack dies. Soon after, GKN Automotive presented its prototype project and OSG introduced its EX-CELL-O XK 8-Series spline rolling machine, which was newly installed at its Guanajuato Tech Center (GTO Tech Center) for demonstration purposes.



Scan for GKN's Official Website



GKN Automotive Prototype Manager Ricardo González pose for a photograph with a prototype CV joint at GKN's manufacturing facility in Celaya, Guanajuato, Mexico.

### **OSG EX-CELL-O**

In 2019, OSG further expanded its product portfolio by acquiring EX-CELL-O Corporation, a German company that specializes in cold forming machines and tools that serviced the European market for over 65 years. OSG EX-CELL-O offers highly productive cold forming solutions of involute splines, threads, oil grooves, knurls or other similar shapes on rotationally symmetrical components.

The OSG EX-CELL-O XK 851-6E is an advanced CNC spline rolling machine that is specially developed for high economic processing of passenger car components such as drive shafts, axle shafts, e-motor components or other similar parts.

Major energy consumption reduction is achieved by replacing hydraulic axis drives with electromechanical components, which also reduced carbon footprint and noise level significantly. With its ergonomically optimized machine guarding, the machine design is compact, while allowing for an approximate maximum profile diameter of 80 mm and workpiece length of 1,500 mm.

After numerous meetings and frequent communications, it was determined that GKN Automotive would perform the rolling process at OSG Royco's GTO Tech Center for prototype development, which is located approximately one hour and twenty minutes away from GKN Automotive's Celaya plant by car. Utilizing the EX-CELL-O XK 851-6E spline rolling machine, OSG helped GKN Automotive kickstart its prototype project from product validation, testing, to finalization.

"We require a rolling process on every component that comes into contact with the wheel, engine, transmission, as well as intermediate components," said González. "OSG Royco rolled everything for us to complete the assemblies," González said.

With assistance from OSG Royco, GKN Automotive estimated that approximately 45 percent savings is made on total expenses in comparison to regular production. Factors such as machinery, tooling and labor have been considered in the calculation.

"With prototype, everything is ambiguous," said González. "What we like most about OSG Royco is that they never say no and always accept our challenge," González adds.

González elaborated that the strong points of OSG are its technical expertise and global network, which give assurance that expectation will be met with excellent product quality. Many of the prototypes made are already finalized and transferred to the factory for standard production.

The initial plan for GKN Automotive was to make 3,000 drive shafts, meaning that 6,000 CV joints were needed. Today, they have completed around 10,000 pieces, and still have about 1,000 pieces more to wrap up year 2024. GKN Automotive anticipated that production would increase by 30 percent more in the future. The change from gasoline to electric vehicles has prompted automotive makers from every brand to make modifications, which requires new prototypes. Everything being requested by GKN Automotive's clients are in very large quantity. It is one of the company's future agendas to further increase production capacity with OSG Royco.

"To date we have not found another supplier that has a machine to be able to perform outsource processing for what we do," said González. "OSG Royco is our only supplier, and we are happy with their services."



The OSG EX-CELL-O XK 851-6E is an advanced CNC spline rolling machine specially developed for efficient processing of components such as drive shafts, axle shafts, e-motor components or other similar parts.



Scan for OSG EX-CELL-O's Official Website

### **About OSG Royco**

OSG Royco was founded in 1994 to expand the cutting tool market in Latin America. With full support from the OSG Group, OSG Royco became an expert in the manufacturing and sales of taps right from the beginning. Today, with 30 years of experiences, OSG Royco supplies much more than just taps. With three manufacturing facilities in Toluca, Silao and Monterrey, OSG Royco offers a wide range of products and services such as taps, drills, end mills, rack dies, as well as tool reconditioning. OSG Royco's global experience allows the company to understand and appreciate different cultures, where its staff are encouraged to think outside of the box, and to reach out for support from the OSG global network in order to deliver the most optimum solution for its clients. Innovation, technology, commitment and integrity are the basic pillars of this organization and make OSG Royco one of the most reliable companies in the sector.









1. In 2016, OSG Royco's Guanajuato Tech Center (GTO Tech Center) was completed to accelerate product development as well as to provide training for the local tooling community.

2. OSG Royco employees pose for a group photograph at the lobby of the GTO Tech Center in Silao, Guanajuato, Mexico.

3. OSG Royco employees pose for a group photograph at the company headquarters in Toluca, Mexico in celebration of its 30th anniversary in 2024.



Scan for OSG Royco's Official Website



OSG's AE-TL-N DLC coated carbide end mill in a hydraulic holder on the Doosan HM 1000 horizontal machining center.

## **Productivity Packed**

AE-TL-N DLC coated carbide end mill drives greater efficiency in aluminum part processing

**Frank Twomey** 

OSG USA

Founded in 1968, Ross Industries, Inc. is a specialist in food processing and packaging solutions. Some of its key products include meat tenderizers, antimicrobial intervention systems, chilling and freezing equipment, formers and presses, slicers, macerators, tray sealing equipment, and more. All Ross systems are designed to help processors streamline food manufacturing and packaging functions to improve quality, productivity, and food safety while minimizing waste. With more than 50 years of industry expertise, Ross Industries has built an international reputation as one of the world's finest food processing and packaging system providers. Employing approximately 100 staff, Ross Industries' manufacturing plant is located in the city of Midland, Virginia, USA, with an estimate production area of 80,000-square-feet.

Recently, Ross Industries was tasked with reducing cycle times on all of its aluminum parts. OSG Territory Sales Manager Frank Twomey has been in touch with Ross Industries through a distributor for about two years ago. In need to optimize productivity, OSG was given with an opportunity to test cut the upper chamber 6061 aluminum alloy part used in Ross Industries' tray sealers for food packaging.



1. Founded in 1968, Ross Industries, Inc. is a specialist in food processing and packaging solutions. Employing approximately 100 staff, Ross Industries' manufacturing plant is located in the city of Midland, Virginia, USA, with an estimate production area of 80,000-square-feet.

2. A CAD model of the front of the upper chamber, a part used in Ross Industries' tray sealers for food packaging.

3. A CAD model of the back of the upper chamber.



3. The upper chambers are machined usir a Doosan HM 1000 horizontal machining center with CAT-50 spindle taper.

4. The upper chambers are made of 6061 aluminum alloy.

Ross Industries has been producing these aluminum upper chambers for more than 25 years. Approximately 80 chambers are made annually along with thousands of other aluminum parts. The upper chambers are machined using a Doosan HM 1000 horizontal machining center with CAT-50 spindle taper.

Ross Industries was originally using a competitor 1.5-inch diameter indexable shoulder cutter for the application. The competitor tool was used at a speed of 6,000 rpm (2,358 sfm, 717.8 m/min), a feed rate of 120 ipm (3,048 mm/min), 0.005 ipt (0.127 mm/t), 0.3-inch (7.62 mm) radial depth of cut, 0.375-inch (9.525 mm) axial depth of cut, and at a metal removal rate of 13.5 inch<sup>3</sup>/min (221.2 cm<sup>3</sup>/min).

Upon a detail evaluation of the application, Twomey recommended OSG's 3-flute 1-inch diameter AE-TL-N DLC coated square end mill (EDP# 86301809). The AE-TL-N DLC coated carbide end mill is extremely effective for non-ferrous materials such as aluminum alloys that require welding resistance and lubricity. With excellent cutting sharpness, it is able to suppress burrs to achieve superb surface finish. The AE-TL-N features a unique flute form to enable trouble-free chip evacuation and a large core design for high rigidity to prevent chattering. Its center cutting edge configuration enables the tool to be used for plunging. Furthermore, with the addition of OSG's DLC-SUPER HARD coating, long tool life can be achieved. This end mill series is available in square, sharp corner edge and radius types to accommodate a wide range of applications.

The AE-TL-N DLC coated carbide end mill was tested at a speed of 5,125 rpm (1,343 sfm, 408.7 m/min), a feed rate of 231 ipm (5,867 mm/min), 0.015 ipt (0.382 mm/t), 0.14-inch (3.556 mm) radial depth of cut, 1.62-inch (41.148 mm) axial depth of cut, and at a metal removal rate of 52.39 inch<sup>3</sup>/min (858.5 cm<sup>3</sup>/min). Cycle time on the upper chambers went from 34.5 hours to nine hours.

By switching to the AE-TL-N, Ross Industries has reduced about 75 percent of cycle time on the upper chambers and is now on average achieving a 150 percent cycle time reduction on other aluminum parts.

"This end mill creates chips so fast that our machines chip conveyors couldn't keep up," said Ross Industries Machine Shop Manager Greg Williams. "We had to speed up the conveyors."

Taken in consideration of factors such as tool change time, machine cost, labor, etc., it is estimated that an annual cost savings of \$183,000 USD can be gained. In addition to the upper chamber part, Ross Industries has also converted all of its aluminum end mills to OSG's AE-TL-N series in various sizes.

"With the performance and consistent tool life of the AE-TL-N we are able to run these tools lights out," said Williams. "In some cases, it is able to achieve as much as four times the metal removal rate versus the competitor tool."



The AE-TL-N DLC coated carbide end mill is extremely effective for non-ferrous materials such as aluminum alloys that require welding resistance and lubricity.



From left, Tecnomeccanica Tools Owner Piergiorgio Cervone, Guerrini Industry S.p.A. Production Manager Fabrizio Tavoloni, Guerrini Industry S.p.A. Production Manager Nicolò Tavoloni, and OSG Italia Engineering Manager Andrea Severi pose for a photograph at Guerrini's manufacturing facility in Casterlfidardo, Ancona, Italy.

## **Effective Chip Control**

ADO-SUS carbide drill and Z-SFT spiral flute tap demonstrate exceptional performance and chip control in automotive part production made of AISI 430 Nb (ferritic) stainless steel

### Andrea Severi

OSG Italia

Chip control is one of the most prominent variables in shopfloor efficiency as cutting chip related problems are the root causes of defective parts, shortened tool life, poor surface finish, among others. These concerns are time-consuming to resolve and can significantly impact hours of production time. By taking control of cutting chips, machining time and downtime can be minimized even in small lot production to reduce overall manufacturing cost.

The elimination of cutting chip problems and achieving stable long tool life in its clamping nut production are some of the key objectives of Guerrini Industry S.p.A. (Guerrini), a leading manufacturer of precision turned metal parts. Headquartered in Casterlfidardo, Ancona, Italy, Guerrini was originally founded in 1962 as a small artisan company. Over the years, Guerrini has evolved into a major national company in the precision turning of small metal parts, servicing various sectors including automotive, electromechanics, hydraulics, appliances, and more. Automotive in particular, is a key sector for Guerrini and currently represents more than 50 percent of the company's turnover.



1. Headquartered in Casterlfidardo, Ancona, Italy, Guerrini Industry S.p.A. is a leading manufacturer of precision turned metal parts.

2. Guerrini employs approximately 80 staff at its 7,500-square-meter production plant with 80 machines, 60 of which are CNC lathes.

3. Custom clamping nuts made of AISI 430 Nb (ferritic) stainless steel. The production capacity of Guerrini's plant is estimated to be around 1,500,000 pieces annually.

4. Guerrini uses an INDEX MS32 CNC multi-spindle machine for the processing of its clamping nut production made of AISI 430 Nb stainless steel.

5. An inside view of the INDEX MS32 CNC multi-spindle machine.

Today, Guerrini employs approximately 80 staff at its 7,500-square-meter production plant with 80 machines, 60 of which are CNC lathes. Guerrini's constant growth is contributed by the quality of its products, which has allowed the company to obtain important certifications, as well as continuous expansion and investment in cutting-edge technology to offer customers flexibility, speed, reliability and timely delivery. In addition, Guerrini stands out for the possibility of complete project management thanks to a vast and consolidated fleet of qualified and certified suppliers. The ability to guarantee a total solution and a single point of contact for all aspects of the order saves the customer from an additional step to complete the production chain, which is optimized to the maximum.

Recently, Guerrini was looking to improve chip control and tool life on a custom clamping nut production developed for a client in the automotive sector. The production capacity of Guerrini's plant is estimated to be around 1,500,000 pieces annually based on statistics from 2020, with lot size averaging between 80,000 to 120,000 pieces. The turned pieces are made of AISI 430 Nb (ferritic) stainless steel and require the machining of one M12 x 1.5 blind hole at a depth of 10.4 mm per part. The pre-drilled hole size is 10.6 mm in diameter. An INDEX MS32 CNC multi-spindle machine is used for the processing.

Originally, Guerrini was using a competitor drill and tap for the application and experienced chip control problems and poor tool life. In search of improvement, Guerrini CNC Production Managers Fabrizio Tavoloni and Nicolò Tavoloni contacted OSG through Tecnomeccanica Tools, a distributor in Jesi, to optimize performance.

Shortly after, OSG Italia Engineering Manager Andrea Severi and OSG Italia Sales Representative Alfredo Nadini visited Guerrini's production facility to evaluate the application. After analyzing the cutting condition, the dual recommended using OSG's 10.6 mm diameter ADO-SUS-3D drill (EDP# 8681060) and a M12 x 1.5 Z-SFT spiral-fluted cutting tap (EDP# 48029176). Both tools are mounted on an ER25 clamp holder spindle. Oil is used for the coolant.

### **ADO-SUS Carbide Drill**

The ADO-SUS coolant-through carbide drill is one of OSG's latest innovations engineered to excel in stainless steel and titanium alloy applications. This drill series has adopted a tool geometry that emphasizes sharpness to reduce work hardening, thereby prolonging tool life for post-processing including reaming and tapping. Its unique flute form encourages the creation of small cutting chips, which is essential for trouble-free chip evacuation. Furthermore, the ADO-SUS has employed a unique oil hole design "MEGA COOLER" for diameter sizes above 6 mm to suppress heat generation and to facilitate smooth chip evacuation. With the addition of OSG's WXL coating, which has strong adhesion strength, high resistance against welding can be achieved. Utilizing OSG's latest cutting tool technology, the ADO-SUS series is capable of drilling stainless steel and titanium alloy with predictable and consistent tool life, making efficient machining of difficult-to-machine materials a reality.



The ADO-SUS coolant-through carbide drill is one of OSG's latest innovations engineered to excel in stainless steel and titanium alloy applications.



The Z-SFT is a powder metal spiral-fluted cutting tap designed for high-speed tapping in general steel and stainless steel with excellent chip control.

### **Z-SFT Spiral Tap**

A part of OSG Europe's high performance Z series, the Z-SFT is a powder metal spiral-fluted cutting tap. Coated with multilayer TiCN coating, the Z-SFT is designed for high-speed tapping in general steel and stainless steel with excellent chip control.

For the machining, the parameters used for the tools are identical to those of the competitor tools. The ADO-SUS carbide drill is used at a cutting speed of 50 m/min and a feed rate of 0.14 mm/rev. In terms of tool life, the competitor drill was able to complete 20,000 holes. The ADO-SUS, on the other hand, completed 90,000 holes before retiring. For the tapping process, a cutting speed of 15 m/min is used. The competitor tap had a tool life of 15,000 holes whereas the Z-SFT is able to process 45,000 holes before wearing out.

Under identical cutting condition, OSG's ADO-SUS drill is able to produce 4.5 times more pieces while the Z-SFT is able to last 3 times longer versus the competition in durability. In addition to the prolonged tool life, the production process has also become more stable, with no machine downtime caused by cutting chip problems. Perfect chip control eliminates potential damage to the part surface and cutting tool, as well as decreases tool setup time thanks to long tool life. By taking complete control of cutting chips, Guerrini is able to optimize its clamp nut production, reduce costs and maximize manufacturing efficiency.



Guerrini was looking to improve chip control and tool life on a custom clamping nut production developed for a client in the automotive sector. The turned pieces are made of AISI 430 Nb (ferritic) stainless steel and require the machining of one M12 x 1.5 blind hole at a depth of 10.4 mm per part.



From left, SNA Europe Industries Iberia Production Manager Iker Udabe and OSG Ibérica Sales Engineer Ander García pose for a photograph inside SNA Europe Industries Iberia's manufacturing facility in Irun, Gipuzkoa, Spain.

## Longer Tool Life, Less Downtime

Custom WX-ST-PNC thread milling cutter enables one pass threading and triples tool life in steel plier production

### Ander García

OSG Ibérica

Established in 2005, SNA Europe Industries Iberia S.A. (SNA Europe Industries Iberia) designs and produces hand tools tailored to the most demanding professionals. The company provides products to an array of industries, including sectors such as construction, automotive, aviation, metal cutting, and more.



Established in 2005, SNA Europe Industries Iberia S.A. designs and produces hand tools tailored to the most demanding professionals.

Tool manufacturing is a combination of raw, basic elements and modern technology. According to SNA Europe, hand tools exist since 2.5 million years ago and some of them have not changed much to the eye over the past century. However, with ongoing developments in materials and manufacturing processes, SNA Europe leads by focusing on innovation, ergonomics and performance. SNA Europe Industries Iberia is a part of the SNA Europe Group, which was founded in 1850 in Eskilstuna, Sweden. SNA Europe Industries Iberia conducts business mainly in Europe.

SNA Europe Industries Iberia's manufacturing plant in Irun, Gipuzkoa, Spain has an estimate land area of 29,000-square-meter and employs 140 staff. Recently, SNA Europe Industries Iberia was looking to improve tool life and cost per unit on its plier production, which the company has been manufacturing for about 15 to 20 years. The annual production volume is estimated to be around 300,000 pieces. Each plier requires the threading of one through hole at a depth of 7 mm with a tap tolerance of 6H. The pliers have three difference thread sizes – M5.5 x 0.5, M6.5 x 0.5 and M6 x 0.5. The parts are machined using a Mazak HTC-400 horizontal machining center.



 Pliers made of 47CrV steel with a hardness of 45 to 47 HRC are positioned inside the machining center.
 Each plier requires the threading of one through hole at a depth of 7 mm with a tap tolerance of 6H.

The pliers are made of 47CrV steel with a hardness of 45 to 47 HRC. Common drawbacks of conventional thread milling tools by helical interpolation in high-temperature and hardened materials are tool deflection and poor thread finish. SNA Europe Industries Iberia originally used a competitor custom thread milling cutter that was implemented many years ago. The competitor cutter was designed mostly based on the part drawing. The tool life of the competitor tool averaged 480 pieces and each tool would be reground twice.

During a visit to SNA Europe Industries Iberia's facility, OSG Ibérica Sales Engineer Ander García learned of the company's search for tool life improvement and requested for an opportunity to conduct a tool trial. Upon a detail evaluation of the application, García recommended a custom version of the WX-ST-PNC carbide thread mill cutter in sizes of M6 x 0.5 and M6.5 x 0.5.



A standard WX-ST-PNC carbide thread mill cutter coated with OSG's WX coating. The WX-ST-PNC's low helix flute form improves tool rigidity, making it ideal for machining steel applications up to 50 HRC.

The WX-ST-PNC is a carbide thread mill cutter coated with OSG's WX coating. The WX-ST-PNC's low helix flute form improves tool rigidity, making it ideal for machining steel applications up to 50 HRC. By employing OSG's toughest premium carbide, the WX-ST-PNC is able to excel with superior durability. To further enhance performance, OSG tailored the WX-ST-PNC based on the actual machining environment, hardness of the material, among other specifications. In particular, to solve the problems of tool deflection and chipping in high-hardness steel machining, a special specification was adopted to stabilize the machining accuracy and improve tool life.

In SNA Europe Industries Iberia's plier production, many workpieces are attached to the tombstone by hand. Although large quantity can be processed with one set-up, a lot of time is required for the initial configuration. Additionally, since the machine operators oversee many machines, as long as stable machining is possible, the staff can concentrate on setup. Therefore, the one trouble SNA Europe Industries Iberia wants to avoid at all costs is having to stop the machine due to a machining defect. According to SNA Europe Industries Iberia, machining efficiency is not a bottleneck. Rather, the company's key objective is to prolong tool life to enable minimum manned operation.

With a unique cutting geometry, OSG's custom WX-ST-PNC is able to process a thread in a single pass and achieve three times longer tool life versus the competitor tool.

"After knowing the limitations of this application, our goal is to get as much life out of the tool as possible," said SNA Europe Industries Iberia Production Manager Iker Udabe. "By switching to OSG's custom thread mill, we are able to make three times more threads versus the previous tool without having to stop the machine and prolong uninterrupted processing."



A custom WX-ST-PNC carbide thread mill cutter is used for the application.





addition of OSG's VI coating (pat. pending in Japan), tool life can be further enhanced.

The A-XPF is a revolutionary product that excels in a wide range of work materials and cutting conditions with improved productivity, such as small-diameter threading in stainless steel and high-speed threading in high-hardness material of 30 HRC.





### **Phoenix PSTW**

6-corner Shoulder Milling Cutter

The OSG Phoenix PSTW 6-corner shoulder milling cutter is designed for high-efficiency heavy-duty milling. The PSTW series is engineered to effectively process long overhang length applications with strong chattering resistance with its high rigidity and positive rake angle geometry.



## **MONOlithbox**

**Tool Vending Machine** 

OSG's MONOlithbox tool vending machine enables digital transformation of tool purchasing and management with simple operations, giving users complete control over cutting tool inventory.

With OSG's MONOlithbox, anyone can easily purchase cutting tools by scanning a barcode. Purchases can be made late at night or even on holidays. The cutting tool inventory is stored in the vending machine, which eliminates the need of having to place an order each time. Furthermore, when tools are purchased, the user will receive a notification and report automatically. This digital inventory management system enables easy monitoring of purchases even from remote locations and reduces the risk of stock shortage.

MONOlithbox is currently available in Japan and selected countries in Asia.





## **Phoenix PDZ**

Indexable Flat Drill

The OSG Phoenix PDZ indexable flat drill is engineered to accommodate a wide range of applications including drilling, counterboring, inclined surface drilling, half-hole drilling, and more. Excellent chip evacuation is achieved by the PDZ's high precision finishing on the flutes, which improves rigidity, chip ejection and reduces cutting forces. Moreover, the PDZ's designated insert features an enhanced muscle breaker with superior chip breaking ability that enables the tool to excel in drilling, counterboring and turning applications.



## **OSG Participates at AMB 2024**



OSG members pose for a group photograph at AMB 2024 held in Stuttgart, Germany.

The OSG Group participated at the AMB international exhibition for metalworking held from September 10 to 14 at Stuttgart, Germany. AMB is a leading trade fair that is held in even-numbered years. AMB has presented the highlights of the international metal working industry since 1982. It is among the top five industry fairs worldwide.

On a total exhibition area of over 120,000 gross square meters, global market and technology leaders gathered to present technologies for tomorrow's production. According to official figures, the trade fair grounds in Stuttgart for the 2024 exhibition were fully occupied with 1,244 exhibitors from 28 countries. More than 65,500 trade visitors from 78 countries attended the show. The 5-day event served as a hub for the metal cutting industry where the latest products, technologies, innovations, services and concepts were presented in all facets.



Live machining demonstrations were held twice per day at the OSG booth to allow participants to experience OSG tools' capabilities firsthand at AMB 2024.



1. OSG members accept an award for the "From Metals to Medals" contest hosted by mav Magazine. Photo courtesy of Landesmesse Stuttgart GmbH & Co. KG.

OSG's "Handball in Hand" metal sculpture earned third place in the "From Metals to Medals" contest hosted by mav Magazine at AMB 2024.
 OSG GmbH Marketing Manager Sabine Esslinger poses for a photograph at the booth of mav Magazine during the award ceremony of the "From Metals to Medals" contest.

4. OSG collaborated with OPEN MIND Technologies AG and milled an aluminum (ENAW 7075) handball metal sculpture measured 30 cm in height and 17 cm in width for the "From Metals to Medals" contest held by mav Magazine at AMB 2024.

At AMB 2024, OSG and its group companies highlighted their latest cutting tool innovations as well as ability to diversify and to supply a wide range of manufacturing solutions to the market. Live machining demonstrations were held twice per day at the OSG booth to allow participants to experience OSG tools' capabilities firsthand. OSG also presented its latest general product catalog with over 1,000 pages filled with new future-oriented tooling innovations.

Last but not least, OSG collaborated with OPEN MIND Technologies AG and milled an aluminum (ENAW 7075) handball metal sculpture measured 30 cm in height and 17 cm in width. Inspired by FrischAuf Göppingen, a men's handball team in Germany, which the company is a sponsor of, OSG finds great similarities between handball and metal working, where both require top performance, precision, efficiency, perseverance and passion. Utilizing OPEN MIND's hyperMILL system and OSG standard tooling, the finely machined "Handball in Hand" metal sculpture was completed and earned third place in the "From Metals to Medals" contest hosted by mav Magazine at AMB 2024.

Handball is known as a team sport in which every single player counts. It is similar when machining highly complex components. From the idea to the finished component, good interaction is required between technical sales, process design, programming and implementation on the machine. The "Handball in Hand" metal sculpture symbolizes teamwork and the connection between OSG GmbH and FrischAuf Göppingen, a men's handball team in Germany, which the company is a sponsor of.



## OSG Around the World

## Employee Interview with **Dominique Thivillier**

#### Tell us about your background.

I have over 30 years of experience in the cutting tool market. After studying mechanical engineering and obtaining a higher technician certificate, I began my career as a sales technician with a French manufacturer of special carbide tools. After this company was bought out, I transitioned to an American cutting tool manufacturer where I worked as a technical sales representative for southern France, in charge of major end users and distributors. During this period, in addition to working full-time, I decided to further my education by attending evening and Saturday classes. After three years, I graduated top of the class and obtained a master's degree in marketing and sales management. With this new qualification in hand, I became head of the distributor network in France and took charge of a team of 10 people in southeastern France, as well as export sales at a Swedish cutting tool company. Later on, an opportunity arose, and I became Sales Director, Managing Director of France, and Head of EMEA West at a German cutting tool company for 11 years. For almost three years, I was in charge of a production unit with more than 60 employees specialized in the manufacture of carbide and PCD cutting tools.



#### Profile

Location: France Position: Managing Director at Nexam Joined OSG Group: 2022 Motto: "A high level of performance and sustainable success can only be achieved through respect in the workplace."

### Tell us about your experience at OSG and your daily routine.

I recently joined the OSG Group, taking over as Managing Director of Nexam in October 2022. As Nexam's Managing Director, in addition to my everyday work of making offers and validating orders, my main objective consists of constantly thinking about how to set up a solid organization that can cope with all the day-to-day ups and downs of the production workshop, and maintain a high level of quality and industrial performance in terms of organization and the products manufactured, with the aim of obtaining a "best in class" product.



Left, Dominique speaks with his team at Nexam during a meeting at the company headquarters in Andrézieux-Bouthéon, France.



1. Center front row, Dominique poses for a company group photograph at NEXAM's headquarters.

2. Nexam's office building in Andrézieux-Bouthéon, France.

3. NEXAM's microstop cages provide precise depth control and ensure perpendicular alignment with the workpiece during countersinking and deburring.

4. One of Nexam's custom drills, engineered to excel in aerospace applications.

5. Dominique joined the OSG Group in October 2022, taking over as Managing Director of Nexam.

#### What is most challenging about your work?

To ensure total satisfaction of our customers and subsidiaries, giving our employees the opportunity to find fulfillment in their work, and having the will to meet our group's objectives in terms of growth and operating results.

#### What is unique about Nexam?

What's unique about Nexam is its people, their skills and the spirit of quality that drives them.

#### **About Nexam**

Nexam was born in 2005 from the historical expertise of Desgranges, a French manufacturer of standard and special cutting tools founded in 1946. Nexam supplies to major French contractors in civil and military aviation, automotive and high-tech related sectors. Its primary efforts are focused on the machining of hard materials, the assembly and machining of composite materials and stacks, and services associated with the cutting tool life cycle.

Located in Andrézieux Bouthéon, France, Nexam currently employs 81 staff and has a 3,000-square-meter production capacity. From Concorde to the A350, Nexam has always been heavily involved in the manufacture of cutting tools for the aeronautical industry. In 2008, Nexam became a strategic supplier for Airbus. In September 2015, Nexam sold 100 percent of its shares to OSG. The acquisition allows OSG to further expand its operations in Europe while Nexam is supplied with valuable means to accelerate product development.



# Turbocharge tapping performance SynchroMaster

Tap Holder

scan for details

