A Finer Point of View

Partnering To Shape The Next Generation Manufacturing Workforce

Education Course Announcement

INTERTECH Announcement & Call For Papers

IDA Member Companies

New Products

Polycrystalline Diamond Tool Materials (PCD) Coupled With Improved Machine Tools Provide Enormous Industry Benefits

Finding The Best Tools For The Job

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Finer Points

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COVER PHOTO
Photo courtesy of West Ohio Tool Company shows a PCD drill being eroded to within 3 micron tolerances on a Walter Helitronic Power Diamond Machine. All fluting, gashing and edge preparation is done in one setup by utilizing a combination of grinding wheels and rotary electrodes. The electrode pictured is a 75/25 tungsten copper wheel which provides the optimum material removal rates while ensuring the sharpness required on the cutting edge for superior tool life.

FINER POINTS is the longest running publication devoted exclusively to the understanding, selection and application of diamond, cubic boron nitride and related materials. It is edited for recipients who are involved in some way with these “superabrasives”, either as providers of the materials, producers of products containing the materials or users of these products (e.g., grinding wheels, dressing tools, drill bits, saw blades, sawing wires, cutting tools, polishing compounds, CVD film products, etc.).

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As a first order of business I would like to thank my predecessor, now Past President Keith Reckling for his service over the years, during his tenure Keith did an excellent job of keeping the Board and the Industrial Diamond Association of America (IDA) focused and moving in a positive direction while ushering in modern changes and useful collaborations.

I often wonder if recipients of Finer Points magazine, published by the IDA, actually read the ‘Point of View’ as expressed by the standing President in the opening pages of the magazine. I can honestly admit that I have likely only read half of them over the years. Therefore, as an experiment in order to gauge true readership I am offering an all-expense paid holiday to the Royal Grand Regency Resort and Spa, located in Aleppo Syria, to the first 50 people who contact me and correctly identify what the acronym IDA stands for! Just kidding of course, but on a more serious note, I would like to inform our IDA members and Finer Points readers about a special event that takes place in my town. For the past 15 years, on the first weekend in June in Brattleboro, Vermont the Strolling of the Heifers occurs. It and has been described as where Mardi Gras meets the Running of the Bulls. It includes a unique Main street parade, which is a celebration of farmers and a plethora of local social organizations and businesses. Over the years it has expanded to a full weekend of events and activities. (Google it!)

It is many things to many people, but at its core it is truly a community event that garners the enthusiastic participation of most members of our community and receives support from hundreds of volunteers.

In the words of one organizer and major sponsor, “Over the years, Strolling of the Heifers has become more than an annual parade and celebration, it has become a real movement in Vermont’s farm and food business that encourages local entrepreneurship, innovation, sustainable living and the values that create resilient communities” ... My point is that if one examines it in an unbiased, detached manner, the Strolling of the Heifers is not very different from the Industrial Diamond Association ... Parallels can be drawn!

Both provide education, connection, collaboration, support, promotion, and opportunity. Both can and do achieve all of the things which keep them pertinent and important in their own community’s collective good will. The Stroll (as we call it) is not unlike any other worthwhile organization or association, for example, the IDA, which relies enormously upon the full participation of the community, its members and associates, is supported by a strong body of volunteers (IDA Board of Directors) and organized by a professional staff who are all committed to promoting the use of Superabrasives, growing the industry, and sustaining the viability of that which affects our industrious, working lives. Personally, I would like to see more of our Association Members, readers of this opinion piece and end users become active participants and strong supporters of our IDA organization and reap the benefits that result.

Sincerely,

Ben Williams, IDA President 2016
Industrial Diamond Association of America
When selecting diamonds... sometimes trusting your eyes alone isn’t enough.

LANDS Superabrasives: Natural, Synthetic and Polycrystalline Diamond and CBN products.

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- Surface Morphology
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- Laser Diffraction
- Shape Characterization
- Specific Gravity
- Size Analysis
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Partnering To Shape
The Next Generation Manufacturing Workforce

By: BRIAN GLOWIAK
Director of the SME Education Foundation

SME, as a nonprofit manufacturing association, works closely with manufacturers to share knowledge, resources, trends and best practices that generate solutions to meet industry needs – all to promote advanced manufacturing technology and the development of a skilled workforce. More than 35 years ago, seeing a need for additional resources, the organization created the SME Education Foundation to serve the manufacturing industry by inspiring, preparing and supporting young men and women for successful careers in manufacturing. Since 1979 the Foundation has been building students’ awareness and interest in the industry, while filling the much-needed talent pipeline of manufacturing engineers and skilled technologists.

Today, perhaps more than ever, U.S. manufacturers are experiencing challenges in finding skilled workers to fill available openings. The industry is facing a trifecta of events that stands to only increase the skills gap problem – advanced technologies, an aging workforce, and misperceptions about the manufacturing industry. By 2025, an estimated 3.5 million manufacturing jobs are expected to become available in the U.S.; however there could be a potential shortfall of two million skilled workers – including manufacturing engineers, machinists, welders, CNC programmers, and robotics technicians – unless action is taken to attract and train the future workforce.

As technology advances, such as the increasing use of lasers in the processing of synthetic diamonds for tooling applications, it is becoming increasingly difficult for manufacturers to find the workers with the proper skills needed to compete in today’s advanced manufacturing industry. Further exacerbating the talent shortage are several hundred thousand new positions that will be created due to economic expansion and an escalating number of baby boomers eligible for retirement. Within the next ten years, an estimated 2.7 million manufacturing workers are forecasted to reach retirement age. All too often, young people are not aware the jobs and opportunities in manufacturing exist, or they lack information about the training, skills, and resources available to secure these positions.

One of the contributing factors to the lack of interest among youth in manufacturing is the perceived image of the industry as being lowtech, unskilled, dangerous and obsolete. In a recent SME survey, parents were asked to share their views related to careers in manufacturing. Not too surprisingly, the results show that many parents don’t necessarily have the most current information or an accurate perspective of manufacturing and the available opportunities. For instance, 20 percent of parents surveyed believe manufacturing facilities are outdated and dirty, and half of the respondents don’t perceive manufacturing as an exciting profession that will challenge their children. Moreover, almost one-quarter of those who participated in the national survey do not believe that manufacturing pays well enough to support a comfortable living.

Here, perception does not equal reality. In the superabrasives industry, dirty and dangerous diamond mines have been all but replaced by scientific labs and cleanroom manufacturing facilities turning out synthetic diamonds. Across the industry, manufacturing today represents hightech and innovative facilities with advanced technologies increasingly requiring workers with strong technical training in math and science – as well as analytical and problem-solving skills.

The industry is experiencing a digital revolution through the use of machinery systems that are interconnected through computer networks that can control processes autonomously. Additional technologies, such as 3D printing and robotics, are also fostering the demand for an advanced workforce to operate, design and maintain complex equipment. To address this need for workers, the SME Education Foundation developed PRIME® – Partnership Response In Manufacturing Education – to help stimulate interest in manufacturing and provide students with the opportunity to acquire advanced manufacturing and STEM education with hands-on training, manufacturing industry credentials, and pathways to successful careers.

PRIME provides high school students with opportunities to pursue rewarding careers as engineers and technologists; this includes
these crystals were removed from electroplated CBN wheel's (same manufacturer) after grinding 15,000 Specific Volume Material Removed Vol' (mm^3/mm) of Inconel 718
note the consistent 90 degree fracture mode fracture mode for the AMX which directly relates to the long, consistent grinding cycles (note in the Power vs. Volume chart below)
note that the AMX (Pink line) consistently draws lower power and provides a more free cutting crystal
note that the Competitor H crystal, also removed after grinding the same amount of workpiece materials, exhibits a non-uniform crystal breakdown that is clearly exhibited in the Power vs. Volume chart
vocations involving mechatronics, welding, CNC programming, robotics, and much more. Through PRIME, high schools have access to financial resources and real-life manufacturing curricula, teachers receive industry-relevant training, and students gain practical experience using state-of-the-art tools and equipment deployed within the industry. Additionally, students and teachers have opportunities to engage with manufacturing companies in their local communities.

The SME Education Foundation also provides opportunities for students – PRIME or otherwise – to receive scholarship awards to support their academic pursuits. PRIME’s success is due in part to its tailored and consultative approach to engaging with regional manufacturers to identify their current and future workforce development needs, and then working with local school districts to design and implement customized educational programs to meet these requirements.

There are more than 185 manufacturing partners engaged in the PRIME network today, currently comprised of 38 schools in 22 states and growing. More than 60 percent of these schools have precision machining and metal processing/fabrication programs with dedicated pathways geared to industry standards and credentialing. And many of these programs are introducing students to the concepts and technology of superabrasives for the first time. PRIME exposes youth to the modern manufacturing environment and changes the image of manufacturing to one that is engaging and full of exciting career opportunities. PRIME impacts over 7,500 students annually, with approximately 90 percent of participating high school seniors either entering the manufacturing workforce or pursuing postsecondary education in manufacturing or engineering fields of study.

However, to keep up with the demand for future workers and to strengthen PRIME’s impact on preparing students for successful manufacturing careers, the Foundation is working to expand this network by 100 additional schools over the next five years. With the support of corporate partners like Alcoa, Emerson, and Honda, the Foundation is creating the next generation of manufacturing engineers and technologists and championing one of the most critical elements for innovation success. Through PRIME, companies can play an active role in the development of a trained future workforce specifically tailored to meet their needs.

Partnering with PRIME not only benefits students, educators, schools, and communities, it also allows companies to fulfill two key business objectives: achieve corporate citizenship goals and meet workforce development needs. To ensure our manufacturing sector remains robust and competitive requires a strong STEM-capable workforce. Through PRIME we are making a positive impact in shaping America’s economic vitality in the 21st century.

To learn more about the SME Education Foundation and sponsoring a PRIME high school, visit smeef.org.

Crystallume CVD Diamond

Crystallume has been manufacturing CVD Diamond since 1984 with nine CVD production systems available.

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- Diamond on Silicon
- Diamond on GaN
- Diamond on Silicon Carbide
- Diamond on Graphite
- Free Standing Diamond
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The Apogee design team is focused on your individual needs and requirements to insure that every aspect of your custom project will be handled with the highest degree of professionalism.

We offer a unique process that insures the highest quality product at the most competitive price and our staff understands the importance of a working relationship with our customers to guarantee their complete satisfaction.

You will be extremely pleased with our knowledge and unmatched quality due to decades of experience in drawing refractory metals including Tantalum, Niobium, Zirconium and Titanium cans and cups.

Call or email us today to discuss your individual requirements and allow us to provide you with a custom competitive quote.

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THE INDUSTRIAL DIAMOND ASSOCIATION OF AMERICA (IDA)  

Presents  

“BEST IN CLASS”  
Education Course  

Superabrasive Materials, Principles & Applications  

YG-1 America, Inc. Advanced Manufacturing Center  
11001 Park Charlotte Boulevard • Charlotte, NC 28273 USA  
VISIT: WWW.SUPERABRASIVESEDUCATION.COM FOR COMPLETE DETAILS  

NEW SUPERABRASIVE EDUCATION COURSE  
TWO FULL DAYS  November 16 & 17, 2016  

ONE FULL DAY OF GRINDING • ONE FULL DAY MACHINING  

FEE: $525 USD - EARLY PAYMENT (BY OCTOBER 15, 2016): $475 USD  
ATTENDEES MAY SELECT ONLY THE ONE DAY OF MACHINING OR GRINDING  
AT $275 – EARLY PAYMENT (BY OCTOBER 15, 2016): $250 USD  

LIMITED SEATING, LAST COURSE WAS AT FULL CAPACITY, SO REGISTER EARLY TO GUARANTEE YOUR SPOT!  

Classroom technical and instructional sessions will be highlighted by laboratory demonstrations and class interaction featuring:  

● Truing & Dressing Applications  
● Grinding Demonstrations and Surface Analysis  
● Machining of Exotic Materials  
● Thermal Testing & Evaluations  
● And More!  

OBJECTIVE  

“Superabrasive Materials Principles and Applications” is sponsored by the IDA and designed specifically to educate on the use of industrial diamond, cubic boron nitride (cBN) materials classified as superabrasives. It is Non-commercial, unbiased and representative of accepted principles and practices. Content will include a wide range of products and applications for the automotive, aerospace, medical, electronics, optics and other industries using superabrasives. The attendee will be educated in the primary areas of grinding and machining with peripheral explanation for other uses, such as non-abrasive applications.  

WHO SHOULD ATTEND?  

This Course will educate End Users processing materials made from difficult to machine and grind materials such as hardened steel, stainless steel, superalloys, titanium, high silicon aluminum, composites, ceramics, bi-metals, metal matrix composites, ceramets, glass, and more! It will also educate Machine Tool Builders, Abrasive suppliers, Raw Material Suppliers, Machine Operators, Wheel Makers, Tool Makers, Research Scientists, Academia, Engineers, Sales Personnel or anyone wishing to learn more about superabrasives.
INSTRUCTORS ARE INDUSTRY EXPERTS WITH MANY YEARS COMBINED EXPERIENCE!

Each one has with “real world” knowledge of superabrasives, applications and characteristics. They have already established manufacturing operations in aerospace, automotive and literally every other production operation around the world. Now, you can learn what superabrasives are, where they are used and the characteristics and properties that affect their performance in manufacturing operations. Do you want to understand wear mechanisms in machining and grinding? What is friability? What is a rake angle? What affects chip formation? What crystal is used in a given application? How does burn and thermal damage affect structural integrity of a part? What is residual stress in metal components such as turbine engine fan blades? Why true & dress a wheel? What are the different coolant types and delivery systems? What is edge prep on a cutting tool and why is it performed? What is the Modulus of Resistance and what abrasive performs best on a particular workpiece material and why? If you currently are using conventional abrasives you will learn the advantages of superabrasives and how they can be applied to increase productivity, reduce scrap and improve the cost effectiveness in manufacturing operations.

World Renowned Industry Grinding Expert Jeff Badger, “The Grinding Doc” will be a featured presenter.

About the Grinding Doc

Dr. Jeffrey Badger is an expert in the industrial process of grinding. He works independently as a consultant, helping companies around the world improve their grinding operations and troubleshooting grinding problems. He has worked in grinding facilities in over 30 countries. Dr. Badger is the author of the regular question/answer column “Ask The Grinding Doc” in Cutting Tool Engineering. He is well known for his practical, down-to-earth, yet high-tech approach to the subject.

William Shaffer, President of Conicity Technologies will be a main presenter demonstrating proper edge preparation for polycrystalline cubic boron nitride (PcBN) and polycrystalline diamond (PCD).

The tool edge preparation process, when administered properly, adds strength to the tool cutting edge, lengthens usable tool life, minimizes the propensity of the edge to chip, improves part quality and consistency, and enhances work piece surface finish. With the new workpiece materials bombarding all industries and the ability for CNC machines to run in a “flat-out” untended environment, the performance demands are increasing on cutting tools. The need to produce more predictably performing tools is paramount to the industry.

Attila Szucs, President of Advanced Superabrasive, Inc., the Industry Leading Manufacturer of Truing & Dressing Machines will be instructing on truing and dressing and providing live demonstrations.

ADVANCED SUPERABRASIVES® TRUDRESS PRO

- Standard Direct Drive Spindles Rotary Encoder for angular position
- HMI Controlled disc brake down and end-of-travel stops
- Ability to true wheels from 1/Diameter (6mm to 407mm)
- Small Footprint requires minimal shop floor space
- Real-Time, Live Image
- Servo Driven Oscillation
- Blanchard Ground Precision Table
- Sealed Linear Slides with Positive Air Pressure
- Optional Safety Enclosure

Wheel Dressing Made Easy
INTERTECH 2017 WILL BE THE FEATURED CONFERENCE FOR NEW TECHNOLOGY AND APPLICATION DEVELOPMENT OF SUPERABRASIVES AND SUPER-HARD MATERIALS

INTERTECH 2017 is the leading International Technical Conference on industrial diamond, cubic boron nitride, polycrystallines, CVD diamond, CVD Cubic Boron Nitride, Nanodiamond and other materials classified as superabrasives and ultra-hard materials.

INTERTECH 2017 will serve as a forum for leading experts representing international suppliers, manufacturers, research facilities, academia, endusers, machine tool builders and the scientific community. They will be presenting papers on subjects that will introduce new and thoughtproving technology on industrial and commercial levels. This will be an international “meeting of the minds” for every aspect of ultra-hard material science.

MATERIALS FEATURED THEME

Today’s components in major industries like Aerospace and Automotive are made of exotic and difficult to machine and grind materials such as Titanium, High Silicon Aluminum, Superalloys, High Tech Ceramics, Ceramic Matrix Composites (CMC), Metal Matrix Composites, Carbon Fiber Composites, High Silicon Aluminum, Bi-Metals, Glass, Cermets and others. In production operations these materials require the high productivity, close tolerances and superior performance attainable only by diamond and cBN tooling for machining, grinding and other material removal and finishing operations.

SAN FRANCISCO IS A MAJOR ATTRACTION...

San Francisco is The City by the Bay and renowned as The Paris of the West. It is one of the most famous American cities and overflowing with cultural and historical wealth. INTERTECH has been held in many locations over the last 16 years and in 2017 this sensational event will be held in San Francisco, California USA. INTERTECH is known for excellent locations and exceptional service and INTERTECH 2017 will carry on that tradition at the San Francisco Airport Marriott Waterfront. We are anticipating the usual excellent attention and personal service that has become the standard of INTERTECH conferences. The Marriott boasts beautiful accommodations, magnificent meeting rooms and luxurious amenities. San Francisco is the cultural, commercial, and financial center of Northern California and the fourth-most populous city in the state. The California Gold Rush of 1849 brought rapid growth, but three-quarters of the city was destroyed by the 1906 catastrophic earthquake and fire. San Francisco was quickly rebuilt and has become known for its steep rolling hills, eclectic mix of architecture, and landmarks, including the Golden Gate Bridge and the former Alcatraz Federal Penitentiary. Entrepreneurs sought to capitalize on the wealth generated by the Gold Rush with the founding of Wells Fargo and the Bank of California. Development of the Port of San Francisco and the establishment of the overland rail system helped make the Bay Area a center for trade. Catering to the needs and tastes of the growing population, Levi Strauss opened a dry goods business and Domingo Ghirardelli began manufacturing chocolate. San Francisco is a major city known for its flamboyant style, stately hotels, ostentatious mansions on Nob Hill, and a thriving arts scene.

San Francisco’s Chinatown is the oldest and one of the largest in North America. The historic center of San Francisco is the northeast quadrant of the city anchored by Market Street and the waterfront. It is here that the Financial District is centered, with Union Square, the principal shopping and hotel district nearby. Cable cars carry riders up steep inclines to the summit of Nob Hill, once the home of the city’s business tycoons, and down to the waterfront tourist attractions of Fisherman’s Wharf, and Pier 39, where many restaurants feature Dungeness crab from a still-active fishing industry. Also in this quadrant are Russian Hill, a residential neighborhood with the famously crooked Lombard Street, North Beach, the city’s Little Italy and Telegraph Hill, which features Coit Tower.

YOU CAN BE A PART OF THIS EXCITING EVENT!

We are now soliciting commercial and technical papers of approximately 30-45 minutes in length that address the research of these super-hard materials as well as the dynamics and application of superabrasive systems in automotive and other industries as well (see: Areas of Consideration) with a focus on new technology, tooling, workpiece materials, machines and applications related to increased PRODUCTIVITY and PERFORMANCE. Consideration for papers is being made at this time and abstracts are now being accepted; contact us today to be considered. This will be the most comprehensive event ever held on diamond and cubic boron nitride superabrasives used to machine and grind exotic and difficult to work raw materials for components in major industries like Automotive, Aerospace and similar industries!

Photos of San Francisco for INTERTECH 2017 courtesy of San Francisco Convention & Tourism Bureau.

The Industrial Diamond Association of America Announces INTERTECH 2017
April 20, 21 & 22, 2017

www.intertechconference.com

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AREAS OF CONSIDERATION FOR PAPERS FEATURING PAPERS ON SUPERABRASIVES AND RAW MATERIALS

SUPERABRASIVE MATERIALS
- Mesh Diamond
- Mesh Cubic Boron Nitride (CBN)
- Polycrystalline Diamond (PCD)
- Polycrystalline Cubic Boron Nitride (PCBN)
- Wire Dies (large crystal and polycrystalline)
- CVD Diamond
- CVD CBN
- Nanodiamond
- New Crystals

MACHINE TOOLS
- Development
- Innovations
- Advancements
- Superabrasive Application
- Designed Machines

RESEARCH & DEVELOPMENT
- New Crystals & Abrasives
- New Coatings
- Bond Development
- Testing/Gauging
- Tool Fabrication
- Materials
- Tooling
- Application Development
- HPHT Technology
- Film (CVD & PVD)
- Magnetohydrological Finishing
- Electrolytic In-process Dressing (ELID) Mirror-Surface Grinding
- Nanotechnology

TOOLING
- Grinding Wheels
- Cutting Tools

AEROSPACE
- Manufacturing
- Rebuilding

AUTOMOTIVE
- Parts Manufacturing
- Gears
- Wheels
- Transmissions
- Engines

CONSTRUCTION/HIGHWAY
- Concrete Aggregates & Variables
- Highway/Runway
- Grading & Grooving
- Bridge Repair
- Renovation
- Block Grinders
- Polishing

ELECTRONICS
- Disc Texturing
- Wafer Mfg.
- Polishing
- Optic Windows
- Semiconductors
- Heat Sinks
- Coatings
- Glass
- Lens Generation
- Polishing
- Pencil Edging

MACHINE TOOLS
- Development
- Innovations
- Advancements
- Superabrasive Adaptation

MEDICAL
- Surgical Knives
- Prosthesis Fabrication
- MINING/DRILLING/NATURAL RESOURCE EXPLORATION
- Drills & Bits
- Application

NANOTECHNOLOGY
- Medical Developments
- Industrial Applications
- Electronics
- Other Research & Developments

OTHER MANUFACTURING
- Pumps
- Motors
- Heavy Equipment
- OPTICS
- Polishing
- Lens Generation
- Diamond Coating

STONE PROCESSING
- Quarrying
- Sawing
- Polishing

SUPPLIERS TO SUPERABRASIVE INDUSTRY
- Raw Materials
- Coolants
- Chemicals
- Measuring, Gauging & Safety
- Pressing Equipment

OTHER NEW TECHNOLOGY & APPLICATION DEVELOPMENT
- Other

WIND & TURBINES
- Gears
- Vanes
- Shafts
- Frames

WIRE DRAWING
- New Technology
- Applications
- Manufacturing

WOODWORKING
- Hard Woods
- Fiberboard
- Laminates
- Composites

OTHER NEW TECHNOLOGY & APPLICATION DEVELOPMENT
- Other

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ELEMENT SIX LAUNCHES ITS DIAMOX TECHNOLOGY FOR THE ELECTROCHEMICAL TREATMENT OF HIGHLY CONTAMINATED WASTEWATER

Element Six, a world leader in synthetic diamond supermaterials and member of The De Beers Group of Companies, announced the next generation of its Diamox electrochemical advanced oxidation cell technology. Diamox is a cost effective and highly efficient wastewater treatment electrochemical cell, designed using free-standing boron doped diamond electrodes. Diamox is effective in treating extremely contaminated industrial wastewater that cannot be treated by biological methods. This packaged reactor is simple to implement in a pilot project with an industry-leading wastewater treatment company, delivering unparalleled electrochemical oxidation capacity that can be scaled to meet industry requirements. For more information please visit www.e6.com/Diamox.

LACH DIAMOND WILL SHOW PCD END MILL CUTTERS, CUTTER HEADS AND DRILLS FOR COMPOSITE MATERIALS AT IMTS, CHICAGO

Horst Lach's discovery of spark erosion for the machining and cutting of polycrystalline electro-conductive cutting materials (such as PCD) in 1978 opened unimagined possibilities and a new future for the soon to be named “PCD or diamond tools”. Traditional cutting materials, such as the cutting material provided by General Electrics in 1973, required time-intensive grinding with diamond wheels. Now, the new erosion procedure shortened grinding times – and as a result tool prices – significantly. Once again, LACH DIAMOND’s pioneering role led to the invention of “spark grinding” – and later to the development of a new erosion grinding machine EDG-plus. PCD milling cutters, scoring saws, sawblades, drills, step drills and other tools are now successfully established in the composite industry. More information will be provided at IMTS in Chicago, booth # W 2108 or at www.lach-diamond.com

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Advanced manufacturing technologies are helping to push the United States back toward being the most competitive manufacturing nation in the world, according to a new survey of global CEOs and other senior executives. While China is the world’s most competitive manufacturing nation, according to the 2016 Global Manufacturing Competitiveness Index developed by Deloitte and the Council on Competitiveness, the U.S., now ranked second, is expected to take the top spot by 2020.

U.S. manufacturers are investing in technologies such as predictive analytics, the Internet of Things (IoT), smart factories, and advanced materials that will be keys to improved competitiveness in the coming years. Other traditional manufacturing powerhouses – Germany, Japan and the United Kingdom – are making similar investments that will maintain or improve their competitive positions. While technology is a critical factor in future competitiveness, manufacturers rank talent as the most critical driver of competitiveness. Just behind is cost competitiveness and productivity, not surprising given slow growth in most economies, and then supplier network.

What accounts for China’s anticipated drop to second in manufacturing competitiveness? Though China has increased its investment in R&D, the economy is slowing and manufacturing activity has dropped, resulting in excess capacity. The report notes that China’s auto industry has capacity utilization of 70% versus nearly 100% in 2009. China also is seeing a rise in labor costs, up five-fold since 2005. “Concerned by rising labor costs and declining cost arbitrage between advanced economies and China, some companies from advanced economies have moved their production to alternate low-cost nations or back to their home nations,” the report states.

Compared to the 2013 survey, U.S. manufacturing executives were more favorable about policies in the country. They cited as helping to create a competitive advantage U.S. policies on sustainability, technology transfer, monetary control, science and innovation, foreign direct investment, intellectual property protection, and safety and health regulation. Working against U.S. manufacturers, said survey respondents, were policies on corporate tax rates, healthcare, labor, and taxation of foreign earnings. The survey shows two strong regions for manufacturing have emerged. For North America, the United States, Canada and Mexico are all in the top 10 most competitive countries today and will remain so in 2020, executives predict. By 2020, the top 10 is also expected to have five Asia Pacific nations – China, Japan, South Korea, Taiwan and India. India is expected to jump from number 11 in 2016 to number 5 in 2020.

Once growth darlings, the BRIC nations have felt the brakes applied on their economies. Brazil fell from the eighth most competitive nation in 2013 to 29th in 2016. Russia dropped from 28th in 2013 to 32nd in 2016. China and India are expected to remain in the top 10 most competitive nations. Likely to take an increasingly important role in global manufacturing are the so-called Mighty Five – Malaysia, India, Thailand, Indonesia and Vietnam. “These nations could represent a ‘New China’ in terms of low cost labor, agile manufacturing capabilities, favorable demographic profiles, market and economic growth,” the report stated.

The report concludes that the most competitive manufacturing nations are embracing higher-value manufacturing profiles reflective of Industry 4.0. “In the wake of this transformation, the days when a country could establish a position of manufacturing dominance on the back of a single point of strength, such as cost competitiveness, are decidedly gone,” the report notes. “In fact, leading countries are taking a much more balanced approach to talent, cost competitiveness, and innovation to set them apart from the global crowd.”

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Polycrystalline Diamond Tool Materials (PCD) Coupled With Improved Machine Tools Provide Enormous Industry Benefits

By: West Ohio Tool Company

Diamond cutting tools, primarily using PCD (polycrystalline diamond) materials have been providing added value to machining operations for over 30 years. For most of this period, PCD tools were restricted to planar geometries and time consuming manufacturing methods. Recently with the expansion of tool materials using veined PCD in end mills, and 3D configurations in drills, along with improvements in machine tools, the industry benefits have been enormous.

Element Six, one of the largest manufacturers of PCD materials, formally rolled out their Aero-Dianamics™ product line consisting of AD-M3 Helix, AD-M3 Tube for milling, and AD-D3 Planar, Cone and AD-D2 Chevrons for drilling applications. The Helix blanks consist of a diamond vein sintered in a carbide cylinder finished with a predefined helix angle and has proven very effective at shearing composite materials consisting of multiple fibres, resin layers and varying layer material configurations. The Tube material builds on this success allowing the tool designer to create multiple flutes and varying geometries. On the drill side, the Planar and Cone materials also allow for various design and geometry changes while the Chevrons are used in more traditional designs (Photo 1 - PCD Cylindrical Endmill & Photo 2 - PCD Twist Drill).

For West Ohio Tool Co. in Russells Point, Ohio, and the rest of the toolmaking industry, these changes in available PCD materials have been accompanied by improvements in the machine tools used to create the final cutting tools, and the brazing equipment and techniques used to attach the tool components together. West Ohio Tool customers are now seeing enormous gains in tool life, reductions in tooling changeover and much better finishes when incorporating cutting tools using these new materials in their applications (Photo 3 - Veined PCD Endmill & Photo 4 - Cross Center Tip PCD Drill).

PCD tools from West Ohio Tool provide customers, such as those in the aerospace and automotive industries, outstanding performance and up to 40 percent longer tool life than traditional carbide cutting tools. It is not unusual for the tools to run for years in some applications prompting one of the customers to jokingly comment that it is a “good thing the company name is etched on the tool, otherwise when I retire the next operator would not know where it came from”. One of the company’s diamond cross-center tip drills generated from the Chevron material has logged more than 560,000 holes over a fouryear time span and continues to run with no measurable wear as shown in the attached photograph (Photos 5 & 6 - PCD drill after 560,000 holes). In another application, a tool redesigned by West Ohio tooling engineers went from roughly 150 parts per tool to 3,500 parts per tool, and amazing 230+% improvement in tool life.

These types of customer successes would be impossible to achieve without the advances in both materials and machines, according to Kerry Buchenroth, owner and founder of West Ohio Tool. “In terms of the quick and cost-effective manufacture of these types of tools”, he said “only the most advanced, high-precision CNC tool grinding/eroding technology will enable the company to succeed”.

Diamond is very difficult to grind because of its hardness and the only wheels that are suitable for grinding diamond also are made of diamond. This results in a one to one grinding ratio, meaning that the same amount of material is ground or worn off of the grinding wheel during the process, as is removed from the tool. This is a very
expensive processing solution. As a result, PCD utilizes a conductive binder (cobalt) that not only facilitates the development of the diamond to diamond bond during the creation of the material, but also allows the PCD to be eroded to size using EDM (electrical discharge machines) as opposed to traditional grinders. With finished tool tolerances normally in the three to five micron range accurate processing still is very complex (Photo 7 - HTM3).

West Ohio’s newest machine is a Walter Helitronic Power Diamond which has a two-in-one system that contains grinding capabilities as well as electrical discharge machining. The EDM process uses rotary erosion wheels constructed in standard geometries from a tungsten copper alloy. Using these electrodes, the diamond is eroded before the carbide portions of the finished tool are ground using traditional grinding wheels. West Ohio Tool is the first company in North America to acquire this machine and has been instrumental in working with United Grinding to develop the capabilities (Photo 8 - Walter Helitronic Power Diamond).

The fully automated Power Diamond machine provides complete machining in single clamping cycles. It changes from grinding to eroding, or vice versa, on-the-fly and automatically. In addition to PCD and carbide, the machine processes tools from high-speed steel, cermet and ceramics in diameters from 3 to 320 mm, lengths up to 350 mm and weights as heavy as 50 kg. The machine’s robot improves accessibility to workpieces and makes special applications possible. Depending on the workpiece type or diameter, up to 3,500 parts can be loaded using the robot.

“Unlike large catalog-type tool suppliers that tend to concentrate on higher volumes of simple mass-produced standard items such as inserts, we focus on the low lot size specialty jobs involving complex tools,” explained Kerry Buchenroth. “We create completely special tools, as opposed to simply modifying standard ones and calling them ‘specials’. Naturally, our tools require a bit more design and manufacturing effort and thus can be more expensive. But, they are capable of running at higher feed rates, increased cutting speeds and have longer tool life that results in lower overall processing costs for our customers.”

West Ohio Tool is an all-specials shop, so although there are occasional jobs that consist of a couple hundred pieces, the vast majority of jobs are less than 20 tools. The Tool Designers and Engineering department also pride themselves and combining tools for multiple operations into a single tool saving the customers costs while enhancing overall results. Recently, one of the customers that was constantly returning and replacing damaged tools worked with West Ohio Tool designers and received a solution that used arbors modified with keyways and pins along with matching items on the tools so that nothing could be assembled or loaded incorrectly. It is anticipated that this will solve the issues and reduce tooling costs tremendously. The shop also often meets with customers and designs tooling around part drawings, 3D models or the actual parts.

According to West Ohio Tool Co.’s VP of Operations Scott Ries, the Tool Studio software on the Walter machines is extremely critical to the shop’s tool design efforts and production speeds. Without it, due to the highly complex tool geometries the shop produces, his operators would spend substantially more time programming on older software versions which utilize G and M codes. The Windows-based software allows the shop to simply fill in the required information fields and run the job. But most useful, according to Ries, is the software’s 3D simulation capabilities.

“Simulation is a great advantage, especially with our newest Power Diamond machine,” said Ries. “We can simulate both the grinding and the electrical discharge erosion processes, and, with Tool Studio, what you see in the simulation is what you get. There’s no going back and forth grinding a tool close, checking it, then grinding some more and re-checking. We get instantaneous simulation that we can either run the program from or use to make adjustments using the on screen images.” This was the primary reason that West Ohio Tool elected to start rebuilding some of the older Walter machines for other operations.
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He went on to say the simulations streamline communication with customers during the tool design stage to shorten iteration time frames. In the past, the shop had to fabricate an actual tool and send it to the customer for feedback. Now, it designs a tool and can export a 3D concept model then, once approved, uses that model to quickly program the tool in Tool Studio. And the new Tool Studio solution for erosion makes operations possible that were once only available for solid carbide or high-speed tools (Photo 9 - West Ohio Tool Designer).

When it comes to automation, West Ohio Tool’s lower lot sizes tend to present a challenge, but the shop automates wherever and however possible. The new Helitronic Power Diamond machine has built-in pallet automation with a robot, while other grinders in the carbide grinding area use robot arms and gantry systems. Automation, according to Ries, increases the shop’s output through additional lights-out production and extended shifts.

From its beginnings in a barn in 1989, the owners of West Ohio Tool have continuously invested in the newest technology available along with experienced people. The shop’s current facility has room for growth, and Buchenroth has his sights set on expanding the company’s national presence. Now, as they transition from a regional tool supplier to the national level the shop has upgraded to the newest Walter technology from United Grinding for processing both carbide and diamond cutting tools. Within the last year, West Ohio Tool has also added a regional sales manager for the southeastern United States and increased the workforce 15%. A Midwest Sales Engineer is also scheduled to begin in August that has extensive background with diamond tooling. Experienced people, advanced technologies and new materials will continue to set West Ohio Tool apart and aid in future success.

PCD tools from West Ohio Tool provide customers, such as those in the aerospace and automotive industries, outstanding performance and up to 40 percent longer tool life than traditional carbide cutting tools.
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ENGIS CORPORATION NAMES SEAN GILMORE NEW PRESIDENT

Wheeling, IL – Engis Corporation, one of the world’s leading suppliers of diamond abrasives and superfinishing machinery and systems has named Sean Gilmore as its new president. The appointment, effective April 1, 2016, was made and announced by Martin J. Steindler, chairman of the board of the privately-held company. “Mr. Gilmore has been with our company for five years in a management role focused primarily on activities throughout Asia. He has demonstrated the leadership qualities necessary to move the company forward,” Mr. Steindler stated in making the announcement. Mr. Gilmore, who has 34 years of experience in the industrial diamond business, succeeds Stephen Griffin, who has elected to retire as president of Engis. Mr. Griffin has agreed to accept the position of Director – Group Advisor in order to continue to provide guidance based on his 30+ years of experience. “With Mr. Griffin’s vast experience and valuable knowledge of our company and our industry, he will continue to be an essential resource to the Executive Committee as advisor to ensure continuity within the organization as we plan the future,” Mr. Steindler said. For further information contact info@engis.com
Many of the cutter grinding shops today, are trying to achieve faster cycle times and more lights out grinding to meet the demands. If you were to ask these companies, they would agree that you are only as good as the equipment and tools that you use. Here at Vollmer we are welcoming one such equipment, the VGrind 160. This particular “Cutter Grinder of the Year” for the cutting tool industry is such that can give more rigidity, resulting in faster speeds and reduced cycle times. I will explain further later how we were able to test this.

Before coming to Vollmer of America I operated multiple different CNC grinding machines over the past decade, some of those being our biggest competitors in this industry. I have seen the good the bad and the complicated. With a good understanding of what the industry had to offer and knowing the limitations of other machines (Photo 1 Robot Arm Unloading a Tool), I had to run some personal test, to see for myself what made this machine so different.

My thoughts going in were “no babying this machine” I was going to push her to the limit. Therefore I set out to find the best superabrasives that would help us achieve our goal; faster feed rates with just as good, if not better, finishes.

Since most of the cycle time in grinding is created by the fluting and plunge grinding, I figured my focus was best geared toward fluting wheels (Photo 2 Wheel Giving Best Results Fluting with Coolant). But where do I start? I never had to purchase wheels before, all I knew were the wheels I had run in the past. So I figured I would start fresh since no wheels had ever really impressed me. Therefore, I turned to some contacts that I had made while attending a well know grinding course in New York. Who would know better than the companies processing the diamonds?

From here I was given a few different contacts from various wheel companies. One thing that I quickly realized is, you have to talk to the right people. I found that talking to the bond engineers was most helpful in deciding what our best options were. One particular company was happy to arrange this, in fact even suggesting it at the beginning of our conversations. I started out by ordering wheels from the three companies that seemed most knowledgeable and helpful.

Running the same tool a 12.00 mm X 50 mm LOC 4 flute endmill (Photo 3 DSC_0009). I must add that all of these runs were with the most optimal coolant placement, and a variable frequency pump giving us a guaranteed 6 bar of pressure at all times. Furthermore, every run was with one pass 3.00 mm doc and no spark out. Also, the proper grit stick was used for each specific wheel. This at times meant not using the stick the wheel company sent with the wheel. All wheels were trued, and balanced to 2.5G at 10,000 RPM.

In this article I will be referring to Specific Material Removal Rate (SMRR mm²/s) otherwise known as Q’, and Grit Penetration Depth (GP µm) your chip load for grinding.

Our current wheel was a 280 Grit which seemed to be a resin bond wheel with some sort of rough machined aluminum for a core (see image). With this wheel we were fluting at 80 mm/min with a spindle load of 28%, SMRR = 4.0 mm²/S and GP = .44 µm. When I tried increasing the feedrate or slowing the rpm of the wheel to achieve a better
Grit penetration depth, the machine would start filling up with a lot of mist and burning would result on the tool. This was clearly not the wheel we wanted to continue with to show our machines capabilities (Photo 4 Starting Wheel on a Three Wheel Package, Fluting).

Now for our first test wheel (a resin bond type of wheel D76 (200-230 Grit) the core was an aerospace grade aluminum. I decided to start with the numbers from our current wheel and then increase the feedrate from there. I could quickly tell that this wheel was going to be able to do much more work. By the second flute I was able to push to 125 mm/min and by the third was up to 150 mm/min with a spindle load of 58%. This resulted in the following SMRR = 7.5 mm2/s; GP = .58 μm. Any further speeds would result the same as the original wheel, increased heat and burn. I then switched wheels to one that was a copper core and resin copper hybrid bond, 220 grit (see image). I once again started with the parameters of the last wheel and increased from there. The end result was very promising, slight adjustments were made to the RPM of the wheel to ensure self-dressing, however with a 200 mm/min feedrate I thought “this is the wheel to beat”. I quickly realized though that the form holding on this wheel was not as good and broke down nearly .050 MM a tool. This was
not so much a concern, due to the machines capability to probe the wheel and compensate for the wear during a longer run. The following is the technical data received by this wheel, SMRR = 10.0 mm2/s GP = .78 µm. When I pushed the wheel any faster the breakdown in form holding became incredibly too severe. Finally, we switched to a little more unconventional wheel a metal bond hybrid wheel size D 54 (270-325 Grit). My hopes were not as high with this wheel due to the smaller grit size and the metal bond. However to my complete dismay, this wheel performed the best by far. With an ending feedrate of 250 mm/min and with a spindle load of 56% I was amazed, not only by the better finish that was left but also by the feedrate (see image). The following were the technical specifications for this wheel: SMRR = 12.5 mm2/s and GR = .85 µm.

When we tried increasing the feedrate to 275 mm/min, the wheel unfortunately separated from the core resulting in 4, almost even, sections of bond. We are receiving a replacement wheel so we can test the longevity of the form, as it didn’t seem to self-dress too much over a period of 3 parts. Furthermore the machine didn’t react as if the wheel was loading too much either. However we do need a wheel that can self-sharpen due to lack of wheel sticking during unmanned grinding (Photo 5 Wheel Giving Best Results Fluting with no Coolant).

IN CONCLUSION

I have seen firsthand the abilities of the VGrind 160. The rigidity of the machine with the proper tooling really can cut down cycle times and leave you with a great finish. But just as you wouldn’t drive a Lamborghini with conventional wheels and fuel, you too have to have the proper mix backing your machine. With that in mind, there is no doubt that this machine could be that equipment companies are looking to for faster production. We will continue to explore new wheels and carbide to ensure our fastest speeds for our customers (Photo 6 Starting Fluting Wheel Viewed through The Robot Loading Door).
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2016 EDITORIAL CALENDAR

Planned issues, topics and closing dates*:

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<th>Editorial Feature*</th>
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<td>IMTS Preview, Education and Innovative Technology</td>
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<td>Fall 2016</td>
<td>Diamond, cBN and Polycrystalline Materials</td>
<td>Sept. 15, 2016</td>
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*Editorial topics & closings subject to change

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Provide names of principle officers or partners:

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How long has your company been engaged in superabrasive/ultra-hard material industry?

1. __________________________________________________________________________________________

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WHAT DOES THE IDA DO?

◆ Oversees Statistics Reporting Program
◆ Establishes Industry Standards
◆ Interacts With Global Associations And Organizations
◆ Creates And Distributes Market Studies & Data
◆ Organizes And Presents Technical Seminars & Conferences
◆ Serves As A Government Liaison For Industry Guidelines And Regulations
◆ Participates As Member Of World Diamond Council
◆ Provides Safety / Regulatory Reports And Advisement
◆ Resource For General Information And Consultation

OTHER MEMBER SERVICES

◆ Publishes Quarterly Magazine
◆ Holds Annual Conventions
◆ Hosts IDA Website With Member Focus And Direction
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◆ Acts As A Collective Voice For Industry Concerns
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