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SEE PAGE 17

What is Augmented Reality in the Manufacturing Industry?

SEE PAGE 3

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# CONTENTS

OCTOBER-NOVEMBER 2023 | ISSUE 292

## INDUSTRY INSIGHTS

- 03** Delmia: Augmented Reality in the Manufacturing Industry
- 11** Lean and Quality – a Match Made in Manufacturing Heaven
- 17** Celebrating 60 Years of Loyal Service, The Sousa Corp.  
Acquire New Thermal Cycling Furnace

## INDUSTRY NEWS

- 19** Regional Press

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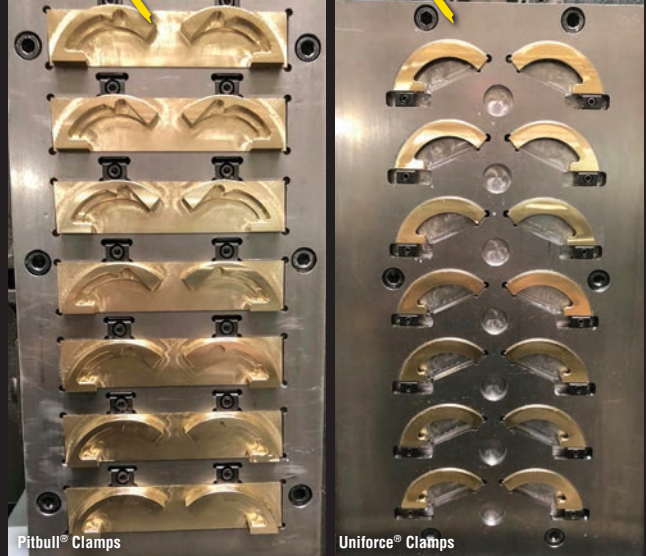
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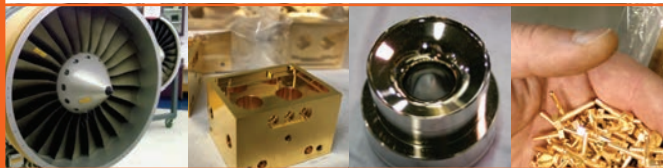
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## WHAT IS AUGMENTED REALITY IN THE MANUFACTURING INDUSTRY?



*Wendy Mlynarek, Strategic Business Development Director at DELMIA takes a closer look at the many applications of augmented reality in the manufacturing sector, whilst also exploring some of the basics for the sector.*

### **The Basics of Augmented Reality**

#### **Definition of Augmented Reality for Manufacturing Accuracy**

You've probably heard the term augmented reality, and while we understand what it means from an entertainment perspective, what is its role in a manufacturing work environment?

Often assimilated as a strange term in science fiction movies, augmented reality is now closer to everyday life and gradually evolving into the industrial world.

Augmented reality (AR) technology integrates virtual elements in 3D (in real-time) within a real environment. The principle is to combine the virtual and the real worlds digitally to provide perfect integration.

#### **What is the difference between augmented reality and virtual reality?**

Before continuing, it is important to understand the difference between all the different existing technologies: mixed reality, virtual or augmented reality, so many terms for which we will provide some explanations.

## What is Augmented Reality?

While we have already covered this concept previously, it's important to keep it in mind as we highlight the difference with the term virtual reality (or VR).

Here we don't just superimpose virtual information on an image but integrate synthetic information in the real environment (we consider that an element can hide certain information, etc.).

## What is Virtual Reality?

Conversely, virtual reality (VR) immerses a user in reality entirely generated and assisted by a computer. Immersion is typically enabled by hardware devices such as VR goggles, virtual reality headsets, or walled rooms with video screens to fill the user's entire field of view. VR brings an immersion in a 100% synthetic/digital environment.

## Augmented Virtual Reality or Augmented Virtuality

What's behind this new term? It is nothing more or less than another way of characterizing virtual data. Here, digital data is not displayed in a real environment but the opposite.

One or more pieces of information from the real world is imported and displayed in a digital environment. For example, when a user equipped with a virtual reality helmet sees his own hands appear while immersed in a digital world and interacts with it.

## What about mixed reality?

Mixed reality is a fusion between real and virtual worlds where digital and physical objects (e.g. mixed reality headsets) cohabit to create new environments.

Mixed reality is differentiated by a very specific interaction of digital content with physical space. Nevertheless, it remains a dimension that covers all forms of augmented reality, that is, all degrees of fusion between the real and virtual worlds.

To summarize, augmented reality brings digital content directly into the real world, virtual reality displays physical information in a digital environment,

and mixed reality is similar to augmented reality.

## How does Augmented Reality work?

Augmented reality adds virtual information (texts, animations, images, 3D models, etc.) into the real environment. To do this, augmented reality inlays this information into the user's environment in different ways:

- Insertion of these elements into a video stream viewed on a screen or tablet. The latter then becomes a window into the world with virtual information embedded.
- Displays on lenses in the user's vision (HoloLens example)
- Use of a projector to display information directly on the object.

However, this information must be embedded in the right place and it's necessary to know the location where it resides. For this purpose, we use one or more sensors to ensure the data location such as:

- Color camera
- Depth sensor
- Inertial unit
- GPS
- Etc.





Augmented reality solutions are therefore distinguished by means of restitution, the means of capture, and the way they use the latter to localize themselves.

The solution's first category aims to locate itself in relation to the global environment. For example, using cell phone sensors (GPS, inertial navigation system, cameras, etc.) allows one to locate oneself outdoors (PokemonGo, Google Maps or LiveView). It displays information that remains stable in relation to the world. In the same way, other solutions allow us to locate ourselves indoors and to place elements that will remain anchored and stable in our environment.



## Reality in the Industry

### What are the advantages of augmented reality in the industry?

Within the future industry, augmented reality reshapes many aspects, such as the increased competence of operators and their way of interacting with a real working environment by importing digital data.

Thus, augmented reality guides operators step by step with information in various forms:

- Digital and contextualized instruction sheets
- Images/videos
- 3D renderings

This replaces the time-consuming, manual processes of the past and makes task execution much faster and simpler. In addition, AR brings multiple gains in the industrial environment, whether remote visualization, better information transmission, or field data feedback to the digital twin.

1. The response to the main industrial challenges
2. Considerable ROI potential
3. Become more efficient with augmented reality
4. Augmented reality helps you gain in quality
5. Get better traceability

Using new technologies such as AR can support the operators in their operational tasks to improve the company's performance and build the operator of tomorrow.

### **The choice to deploy an augmented reality solution is to bring the right information at the right time and place and contribute to:**

- Increasing the skills of operators
- Reduce the risk of errors or non-conformities
- Get it first time right
- Automate and make the creation of AR content as efficient as possible
- Contribute to making the use of software and/or equipment that use AR intuitive and accessible
- Guiding and accompanying operators
- Improve understanding of the operations performed
- Obtain information that can be imported into the real world while feeding the digital twin with the field data collected
- Collect a considerable amount of data to feed the virtual twin



The data collected with augmented reality can be used to promote the digital transformation of information, optimize industrial processes, and contribute to better traceability.

### **The right hardware to use augmented reality in your industry**

*AR applications can be used via various hardware devices:*

- Multimedia system like smartphones or tablets
- Fixed or mobile AR workstation with industrial type cameras
- Projection system
- Augmented reality headsets / augmented reality glasses (RealWear and HoloLens)

These connected tools and augmented reality allow digital work instructions to be easily displayed and visualized regardless of the company's environment.



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**Augmented reality in industry: how to choose the right use case?**

To choose the right use case, focus your efforts and research on operations that generate costly defects (non-conformances), long or unscheduled downtime, plant safety problems or high customer dissatisfaction.

*Before you get started, you should also ask yourself the right questions:*

- Which teams to include in the project?
- Which operations are the source of the most significant number of errors?
- Which ones generate the highest costs?
- Which tasks generate a more or less prolonged stop of production?
- Which one's cause safety problems?

Once these questions are answered, you will be ready to determine the best use case for your plant and launch the project. Then all you have to do is find the solution and above all, the right supplier!

**What will be the future of augmented reality in industry?**

Today, everything deploys and evolves very quickly, and the same goes for these AR technologies that will continually evolve and improve. So, what we can say for the future of these solutions is that the new versions will be based on these different axes:

- The evolution of the ergonomics and performance of certain types of equipment (helmets / smart glasses), which today are not always adapted to industrial environments but are evolving and tending to become more democratic.
- The introduction of multi-modalities, such as voice recognition or gesture control.
- New devices and the multiplication of sensors increase the field of possibilities in terms of algorithms (tracking for example) and optimize the performance of algorithms.

- The improvement of cloud-based tools and the arrival of 5G enable network communication performance compatible with cloud-based execution of AR algorithms.
- Longer system runtimes due to reduced battery consumption.
- A more compact and leaner development.

**About Wendy Mlynarek**

*Wendy Mlynarek has over 25 years of experience in marketing manufacturing solutions globally. She is a Strategic Business Development Director at Dassault Systèmes for the DELMIA brand, supporting Aerospace & Defense and the Virtual Twin Experience Marketing for Manufacturing Operations program.*

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## LEAN AND QUALITY – A MATCH MADE IN MANUFACTURING HEAVEN



Written by Paul Critchley  
(pg. 14 About the author)

Lean isn't going to help you if your quality is bad. Why just make bad stuff faster?"

I hear this comment, or ones like it, more often than I'd like. It's a misnomer that for whatever reason has caught on, even though it couldn't be more wrong. Lean is a lot more than just "better, faster, cheaper." The fact is that Lean and Quality are close cousins, and the relationship needs to be better understood throughout industry.

A former employer of mine learned this lesson the hard way. The manufacturing of one of their products was done in Puerto Rico, but product testing (which was performed on 100% of the units) was being done in Connecticut, so right away we knew we had a "waste of transportation" problem. To give you some perspective, units were about the size and weight of a window air conditioner, so shipping them was costly, and a bit of a pain!

Units would be assembled per specification with vendor certified parts and then shipped to us for testing. Testing each unit took hours, and they would fail about 50% of the time, so back to Puerto Rico they would go for rebuild and/or repair. Units would then be fixed and shipped back to Connecticut for another round of testing. Again, 50% of those units would fail, and the process repeated itself until a unit passed.

For those keeping score: the all-time round-trip record for a unit was seven trips between PR and CT until the unit finally passed.

As all of this was happening, our customer was waiting for their products to be delivered, and we were falling farther and farther behind their schedule. Weekly update phone calls quickly turned into daily ones, which eventually devolved into little more than our customer screaming obscenities at us before hanging up. It wasn't a fun time - for anyone.

In an effort to gain some breathing room, we tried increasing our throughput at the plant. We increased overtime, hoping that an increase in direct labor would help us produce more, and "catch up" to the schedule. We also increased our raw material inventory to such high levels that we were stuffing it anywhere we could find space. We tossed any semblance of lot control out the window—if we came upon a new lot of materials that seemed to "be good," we sucked it into production as fast as we could, pushing all others to the side (for the record, this helped us increase first-time test yield in the short term, but the long-term remained right around 50%—go figure!). Truly, we thought we were doing whatever it took to try and please the customer. We knew we had problems, but given the time and resources we

had, we made the calls we did thinking that if we could run parallel paths (increase throughput to get ahead while troubleshooting the product), we'd eventually work ourselves through the issue.

In retrospect, we should have done a lot of things differently right from the start. We didn't follow any kind of formalized problem-solving methodology, we didn't track test data, and we had poor controls in manufacturing. When units went back to Puerto Rico to get repaired after failing test, there were no instructions or guidance on why the unit had failed or what it had failed for, so the folks there would fix what they thought was the most likely problem component and send it back to Connecticut to see if what they had done worked.

So, considering all of this, would you say that we had a Lean problem, or a quality problem?

It was both, really. Having interdependent groups so far apart in a matrix organization all but guaranteed that miscommunications and misunderstandings would occur. Trips back and forth (for people and for product) were lengthy and expensive. Incomplete data and record keeping made it impossible to properly perform any kind of root cause/corrective action. Increasing raw material levels also caused more problems than it solved. We were tying up more cash, and were literally tripping and knocking over raw materials on the plant floor, undoubtedly causing even more damage. Running oodles of overtime in a futile, non-descript manner meant that folks were getting tired, less productive and morale was suffering. More mistakes than usual were being made that weren't caught until a unit had made the 1,650-mile trip to Connecticut.

Lean isn't about speed—it's about value. Those are two different things that are often mistakenly interchanged. If a customer understands and agrees that a process adds value (and will pay for it), it doesn't really matter how long the cycle time takes (assuming it's not preventing you from meeting their needs). Of course, it helps to look for ways to reduce overall cycle time if you can, but more often than not reducing cycle times aren't anywhere close to being your biggest challenges to adding value. Instead, it's all of the "other" parts

that make up your lead time that need help: the wasted time and effort things spend waiting, being moved, being over processed and overproduced. In our example, we did all of these things, in addition to adding extra inspections and test protocols thinking that those added operations would somehow help us fix our problems. All they really did was slow the process down even more than it already was, and kept us from focusing on other, more important things.

Quality is about value as well, albeit from a slightly different angle. All quality comes at a cost, whether it be good (prevention, appraisal) or poor (internal failure, external failure). Each one of those costs represent different levels of value to the customer, and to the parent organization. Customers won't pay you for defective product, nor will they pay more for good product because your efficiencies are poor. The market determines what price you can charge for your product or service; it's your organizational makeup and internal processes that determine cost. For instance, if processes yield suspect product, the typical response is to increase the inspection frequency/sampling plan to ensure that our customers are protected from receiving bad product. That's spending money on cost-avoidance, which is a poor ROI. That increased inspection ties up resources with non-value-added work (preventing internal failures from becoming external failures), when they'd be better utilized elsewhere, like helping prevent non-conformances from being produced in the first place. That ROI, on the other hand, is much more favorable, since it has a positive effect on things like available machine time, available floor space, reduced inspection needs, etc., which are all also benefits of Lean.

Once we realized this (which took longer than it should have, admittedly), life got easier. We stopped applying band aids and shotgun approaches and started true root cause analysis and problem-solving methods. These helped us to be able to answer some of the issues that were plaguing our poor initial test yield. Some of it was part quality, but some was simply test spec misinterpretation because we didn't have a standardized format to follow. Still others were due



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to some uncontrolled manual operations on the shop floor that everyone had just assumed were being done correctly because the person doing it had done it for so long. All in all, we had lots of rocks to turn over, and had we not finally embraced tenets of both quality

and Lean together, as a unit, I'm not convinced that we'd ever have solved our problems. Eventually, the management and customer calls stopped, and we were able to move on to other, more proactive things. And that was good for everyone!

*About Paul Critchley*

*Paul Critchley is a recognized thought leader on employee engagement and continuous improvement and has helped businesses around the world achieve greater levels of success through the application of Lean techniques. A frequent speaker, he has keynoted at numerous corporate events, as well as at international conventions such as AME's annual Lean conference and at OpEx Week. He's also the host of "The New England Lean Podcast," a weekly show that focuses on Lean leadership and New England-based businesses.*

*Paul is a former Board Member of the Northeast Region of AME, holds a B.S. in Mechanical Engineering, a M.S. degree in Management and a M.S. in Organizational Leadership.*

*He is passionate about Lean and creating organizational cultures that are sustainably engaged. He co-authored his first book - The Whole Professional, A Collection of Essays to Help You Achieve a Full and Satisfying Life to bring a fresh perspective on Work/Life Balance and how individuals and organizations can work together to achieve greater levels of attainment.*



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## CELEBRATING 60 YEARS OF LOYAL SERVICE, THE SOUSA CORP. ACQUIRE NEW THERMAL CYCLING FURNACE

Founded in 1963 by Norman Sousa Sr., the Sousa Corp is a commercial and aerospace business providing quality heat treating services for over 50 years. What started out as a small heat treat shop in West Hartford, CT. that mainly performed hardening and pack carburizing has grown in size and capabilities ever since. As the business grew, Norm Sr. increased the size of the facility and purchased new equipment.

Norman Sousa Jr. purchased the business from his father in 1994 and has been instrumental in growing and modernizing the business. In 2012, The Sousa Corp moved to a much larger, more modern facility in Newington, CT. With the extra room to grow, they immediately increased capacity. They now offer a variety of thermal processes on a wide range of ferrous and non-ferrous materials.

Today, the business is run by Norm Jr. and his three children. They proudly carry on the tradition of their father & grandfather by embracing his values of quality, integrity, and customer service. The Sousa Corp. continues to grow and expand its capacity and capabilities (which range from heat treating to black oxide, material testing, and laboratory services).

Recently, The Sousa Corp. purchased a new thermal cycling furnace to add to their fleet. Vice President Andrew Sousa kindly answered some questions for us about their new acquisition and what it means for the company and its customers.

### **Tell us about the new machine. What is it? Why'd you decide on it?**

*Manufacturer:* DMP Cryosystems Inc.

*Model:* CryoFurnace

This is a thermal cycling furnace that is capable of -300F to 1,200F

### **Give us the applicable specs.**

*Working zone:* 24" Wide x 36" Deep x 24" High  
*It's capable of* 1,800 lbs.

*Temperature range* -300F to 1,200F

### **How does acquisition and installation of this machine bolster The Sousa Corp capabilities?**

We are able to offer true cryogenic capabilities to -300F for the first time.

This also increases our thermal cycling temperature range capabilities.

### **What are The Sousa Corp's current thermocycling capabilities? Describe what you do for your customers and how the thermocycling process fits in.**

*Current capabilities are:* -150F to 325F

*CORRECTED: This article originally ran in our September edition of The Gateway Magazine, and, regretfully, the article had a number of unfortunate typos in the copy. In order to properly frame up the fine work the Sousa Corp. is doing; we are republishing this entire article in the correct format.*

**What are the benefits of thermal cycling?  
Why is it important?**

Thermal cycling, heating, and cooling of material stabilize the crystal structure to minimize or eliminate dimensional changes that would have occurred due to repeated service in environments the experience repeated temperature fluctuation. One example is spacecraft, where being in sunlight and total darkness causes extreme temperature changes every 90 minutes.

**How has thermocycling grown as a service offering for The Sousa Corp over the years?**

In 2010, we first started performing a thermal cycle process to one customer specification on a few different part numbers. Over the years, this has continually increased, and we now process to many different specifications & temperature ranges for several customers.



**What industries do you serve the most in this space? What are common thermocycling requests from these industries?**

Aerospace is currently the most common request, partly due to the fact that any poor performance or failure is impossible to correct.

**Are there other industries you'd like to expand in and hope to with this new machine?**

Tool steels are an area that can benefit from one or more cryogenic cycles, especially when dimensional stability is critical, such as gages. Some studies have shown tool life is extended by cryogenic treatment.

**What excites you about the future of The Sousa Corp? What else should customers look forward to?**

Since The Sousa Corp purchased Bennett Metal Treating in 1963, we have provided personalized service and decades of experience for three generations to assist customers in all facets of metal improvement.

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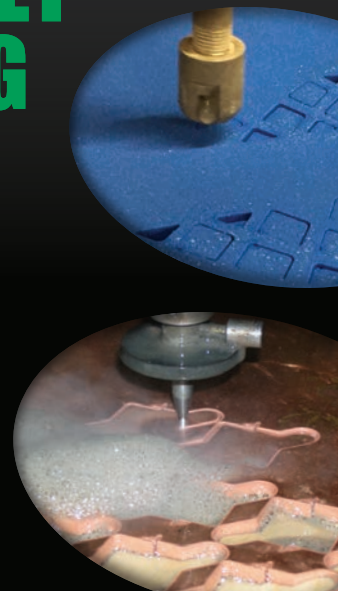
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### Company History

The Sousa Corp. was founded in 1963 when Norman W. Sousa Sr. purchased the assets of The Bennett Metal Treating Company. “Bennett Metal” was founded by Mr. Bennett about 1903.

Mr. Bennett was a one-armed blacksmith, and the company operated in one of the Goodwin Pottery buildings. Pack carburizing, oil-fired furnaces, and oil tempers were standard practice through WWII and into the sixties. Norman began working there in 1947 for then-owner John German. Mr. Bennett had sold and reopened a shop in New Jersey. Soon, Norman had learned the trade and was manager for the new owners, Frederick H. Waterhouse, William J. Luby, and Joseph B. Burns. As absentee owners, they realized they didn’t have control of their investment and decided to sell. Norman had convinced them in 1954 to buy a Dow integral quench furnace, and the modernization began. A C.I. Hayes bright hardening furnace was purchased

in 1963, and the oil-fired carburizing furnaces gave way to two L&N Homocarb furnaces.

Norm Jr. joined the company in 1971, and in the late 70’s, a new addition was put on, and a second larger Dow integral quench furnace and Dow tempers were added. Two vacuum furnaces, a black oxide line, a Cincinnati Sub Zero freezer, a metallurgical lab with a Tukon Microhardness tester, and a Kevex X-Ray spectrometer round out the equipment upgrades. Recently, a Wilson 2000, NIST capable hardness tester with loadcell and electronic depth measurement and SPC capabilities was installed.

The Sousa Corp and its predecessors have been processing commercial, military, and aircraft parts for nearly 100 years. They look forward to continued growth in services and capabilities to serve their customers better as manufacturing changes at an ever-increasing rate.

#### **Contact Information:**

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## Concord Electric Supply Opens First Location on Nantucket

CES began the process of opening its first location on Nantucket in 2016. Seven years later, the branch is ready to serve the island.

Concord Electric Supply (CES) has opened a branch on the island of Nantucket, off Cape Cod Massachusetts. Officially open and ready to serve customers, the company set a goal to open a location over seven years ago. CES has wanted to open since 2016 when District Manager Jeremy Higgins discovered there was a building available through a friend on the island. And relationships have helped get this location open from the beginning.

“One of my friends was an electrical inspector on the island and told me about this building,” said Jeremy. “It popped up at what we thought was perfect timing. We came over, bought the building, and decided to put an apartment upstairs to have employee housing.”

On an island the size of 49 square miles, this branch sits at 4,000 square feet with outside storage. CES Nantucket is located about half a mile from the airport, closer to the middle of the island.

Jeremy added, “The location for this branch is perfect. It’s on a lot in the middle of the island, and the building needed minimal work done.”

While CES was in the process of opening Nantucket, the team encountered their fair share of challenges. Getting through everything from various permits, bringing water down the street for a sprinkler, and building employee housing took time.

“Our hope after spending this time preparing CES Nantucket is that our customers see that we did this for them. There was benefit and value in taking the time to do it right,” said Jeremy. “We want to be here to help them, and we want our customers to receive the best service possible.”

CES Nantucket will be led by Branch Manager Kevin Kitsock. Kevin has 30 years of trade experience, moving to Nantucket in 1993 with previous experience working on Martha’s Vineyard and in New York.

About City Electric Supply (CES) is a family-owned electrical wholesale distributor headquartered in Dallas, Texas. The company was founded in 1951 by Tom Mackie in the United Kingdom and expanded to the United States in 1983. Today, CES employs more than 3,000 people in over 550 branches across the U.S.

CES is dedicated to providing personalized service and support for customers in the residential, commercial, and industrial marketplace. While CES is a large company, it prides itself on keeping its founding principle of empowering people to make local business decisions by providing customers with tailored services for all their electric supply needs.

## Mastercam Announces New Add-On for Additive Manufacturing

Mastercam, a leading CAD/CAM software company out of Tolland, CT, has announced a new Add-On product, Mastercam APlus® by CAMufacturing Solutions, which was designed for additive manufacturing.

APlus brings Additive to the Mastercam user in a form that is consistent with the workflow used for over 40 years.

Using the same interface Mastercam users are familiar with, APlus customers can program, backplot, and simulate their 3D printing scenarios just like they would with traditional toolpaths in Mastercam.

APlus uses Direct Energy Deposition (DED) and has toolpaths developed specifically to handle any geometry in Additive Manufacturing (AM), as well as features and utilities designed to remove uncertainty out of the process and to improve efficiency.

Hybrid manufacturing provides users with the versatility to build parts from scratch, add features to an existing part, or to repair a worn or damaged part. APlus integrates seamlessly with Mastercam to allow users to generate Additive Manufacturing toolpaths, as well as visualize the additive and machining outcome.

Kenneth Fortier, Technical Product Manager, Mastercam says “APlus brings Additive Manufacturing to the Mastercam user in a form that is consistent with the workflow used for over 40 years. Direct Energy Deposition is making its way into many machine shops and being able to program hybrid machines or dedicated additive machines using Mastercam makes the transition seamless. With the hybrid process of alternating adding material and milling allows parts with internally machined features to be created that would have been impossible without additive.”

Since Additive Manufacturing is not simply reversing machining toolpaths, all features and toolpaths are designed and developed to ensure users experience efficient and practical results for the additive and hybrid manufacturing process.

A great application for using APlus is for blade repairs where the tips of individual blades are showing wear. To repair the part, the user machines off the worn tips using a suitable toolpath in Mastercam. Using APlus, you can 3D print or deposit material onto the machined surfaces to near net shape. Finally, you machine the printed sections to the desired specifications. This process can dramatically lower costs when compared to buying or machining a new blade, or even stocking spare parts.

Mastercam APlus® by CAMufacturing Solutions is available for purchase through Mastercam's worldwide Reseller channel. For more information on APlus, please visit [www.mastercam.com/solutions/APlus](http://www.mastercam.com/solutions/APlus).

About Mastercam

Founded in 1983, Mastercam is headquartered in Tolland, Connecticut. Mastercam is a suite of CAD/CAM software created to reduce production time and expense with efficient machining strategies and advanced toolpath technologies like Dynamic Motion™. Mastercam is the world's #1 CAM software, with more than 300,000 installations in industries such as moldmaking, automotive, medical, aerospace, consumer products, and education. It is distributed through an international channel of authorized Mastercam Resellers in 75 countries, providing localized sales, training, and support for 2- through 5-axis routing, milling, and turning; 2- and 4-axis wire EDM; 2D and 3D design; surface and solid modeling; and Swiss machining. For more information, visit [www.mastercam.com](http://www.mastercam.com).

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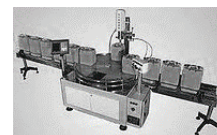
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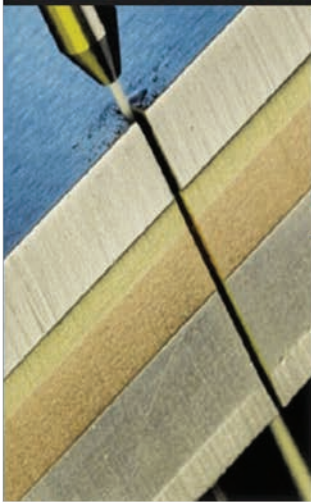
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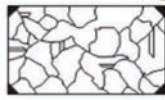
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