Manufacturers of precision components, ranging from automobile parts to orthopedic devices, are under constant pressure to reduce cost while improving quality and delivery. Precision machining processes have been pushed to the limits of available technology. The mechanical drilling of holes is one of the most challenging processes. In many cases, components are drilled at reduced production rates with specialized drilling cycles or custom drilling equipment. The cost of production can be prohibitive, and potential product designs are limited. The problem is compounded by high-performance materials that are increasingly difficult to machine, including metal alloys such as titanium and stainless steel.

**NEED**

**INITIATIVE**

Over the last two decades, the Purdue Center for Materials Processing and Technology (CMPT) (originally part of the NSF Engineering Research Center in 2005 and now part of the Industrial Engineering School and Discovery Park’s Center for Advanced Manufacturing) has built a research program emphasizing the fundamental mechanics of machining processes. The ongoing research, directed by Professor S. Chandrasekar, led to several key discoveries in a technology called Modulation-Assisted Machining (MAM). The CMPTs continued research sponsored by funding from the NSF, DOE and corporate sponsors helped build the framework for new patents that would become the pathway for commercialization of MAM technology. MAM technology enables sustainable increases in the efficiency and performance of industrial machining processes. MAM has generated strong commercial interest because the technology impacts a wide range of industries that rely on precision machining. MAM has also enabled new, transformative methods of materials processing.

M4 Sciences was launched in the Purdue Research Park in 2005 to design and develop advanced technologies for ultra-precision machining. Company founder and CEO James Mann won Discovery Park’s 2006 Entrepreneurship Business Plan Competition and benefited from an innovative Entrepreneurship Boot Camp sponsored by the Burton D. Morgan Center for Entrepreneurship.

Today, M4 Sciences is thriving. One of the company's products, the TriboMAM drilling system, was named as one of R&D Magazine’s 100 most innovative products introduced in 2009. In 2010, the company executed international distribution agreements to distribute and support product sales with end customers and machine tool builders around the world. M4 Sciences has shipped drilling systems in 15 major market countries and is already developing new products and processes with strategic customers. TriboMAM is breaking new barriers in mechanical drilling productivity and sustainable manufacturing for a range of products in the orthopedic, automotive, industrial hydraulics, and oil and gas industries. In 2011 and 2012 M4 Sciences secured technology sub-licensing agreements with NV Bekaert SA, a major partner in the materials manufacturing market. In 2013 M4 Sciences secured additional patents and shipped the first rotating TriboMAM systems, achieving a new milestone in product development. M4 Sciences was initially funded through several sources, including private investment, STTR and SBIR Awards from the National Science Foundation (NSF) and the U.S. Army, and a State of Indiana 21st Century Research & Technology Fund Award.

![M4 Sciences](http://www.purdue.edu/discoverypark)