

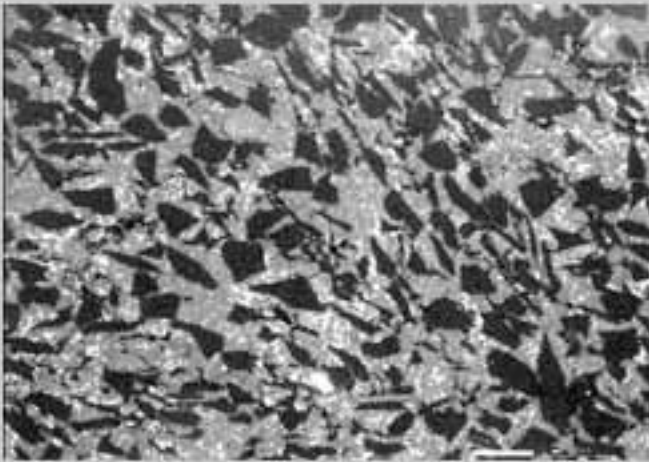


REL

ADVANCED PRODUCTS

MMC MANUFACTURING

Metal Matrix Composites (MMCs) are the wave of the future in part design due to the inherent multi-functionality of this class of materials. The continuous progression of MMC technology along with REL proprietary processing methodologies allow for parts with enhanced properties over conventional engineering materials. REL MMCs are cost-effective, lightweight material alternatives and can be a direct replacement of both structural and non-structural components.



ADVANCED MATERIALS PROCESSING

Through advanced material science theory tempered by practical manufacturing expertise, REL provides your team with increased product performance and weight reduction. At REL we have developed a method to tailor material properties from point to point reducing weight and cost. In other words we can make a part strong in some areas, wear resistant in other areas and stiff in other areas, all in a single light-weight, optimized, cost-effective, multi-functional part. Our SEM laboratory provides immediate visibility of process changes and we often achieve 24-hour process design updates in the prototype phase of a project.

MMC PROCESS AUTOMATION

REL has designed, developed and implemented automated solutions to vertically integrate the MMC process. Highly specialized production equipment has been designed and fabricated in-house to enhance the productivity of our proprietary composites. This unique in-house expertise has allowed REL to streamline MMC production. Implementation of REL automation has resulted in reduced cycle time and decreased labor requirements. Our automation specialists work in conjunction with our manufacturing team to assure our customers high quality, competitively priced products delivered on-time. Examples of automation success include: preform (ceramic reinforcement) production equipment - 4 operators to 1 with equal production; robotic casting cell - 2 operators to 0 with increased production rates.



YOUR SOURCE FOR MMC COMPONENT SOLUTIONS

REL has been manufacturing high quality components for the last 25 years with customers ranging from 1-2 person operations to Fortune 500 companies. REL has the capacity and expertise to meet your production schedule and your budget. With a staff of highly qualified engineers, machinists, fabricators, and casters, customer satisfaction is guaranteed through our internal quality control programs. Advanced product quality planning (APQP) documentation follows every MMC component produced by REL to assure consistent, cost effective, products delivered on time.

COMPANY DIRECTION

The engineering profession is undergoing a paradigm shift. Engineers are no longer asked to find solutions to their problems with commonly engineered materials such as steel or aluminum. There is a push for optimization of designs that cannot be achieved by simply varying the geometry of a homogeneous material. New parts have to be lighter weight, higher performance, and must have increased durability to compete in the global marketplace. REL Inc. is a leader in cutting edge research, design, and life-cycle manufacturing. The ongoing research at REL is paramount to the success of lightweight metal matrix composites (MMCs).

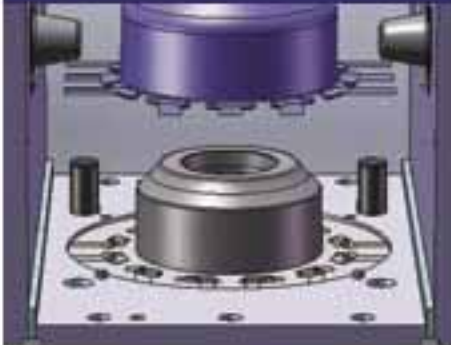


FROM CONCEPT TO PRODUCT

INNOVATIVE PRODUCT DEPLOYMENT

For companies seeking comprehensive product enhancements through advanced materials, REL offers a complete solution: Innovative Product Deployment (IPD). REL's IPD approach generates very rapid iterations of material and manufacturing processes to quickly obtain production ready components. The full development cycle is vertically integrated in-house to ensure product realization from the lab to full production. The primary benefit of the IPD process is a compressed time to market.

PHASE 1



DESIGN AND CAM

Casting die design and metal flow modeling are completed in the first phase.

PHASE 2



CAST PRODUCT

The MMC component is cast in-house on our 1200 ton squeeze cast press.

PHASE 3

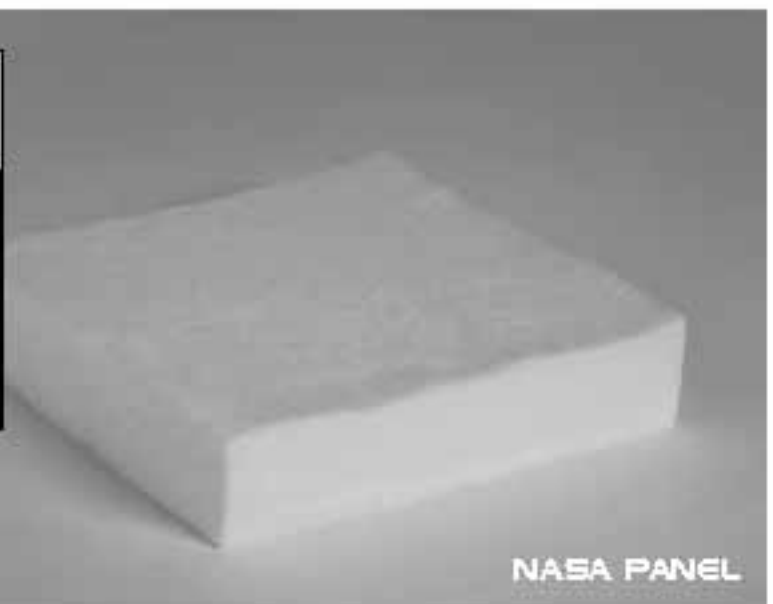


FINAL PRODUCT

Completed MMC product after optimized machining process.

IPD INDUSTRY LEADING TIMELINES

MMC DRUM	3 WEEKS
MMC CUTTING EDGE	4 WEEKS
NASA PANEL	8 WEEKS
ROTOR (IN PRODUCTION)	9 MONTHS

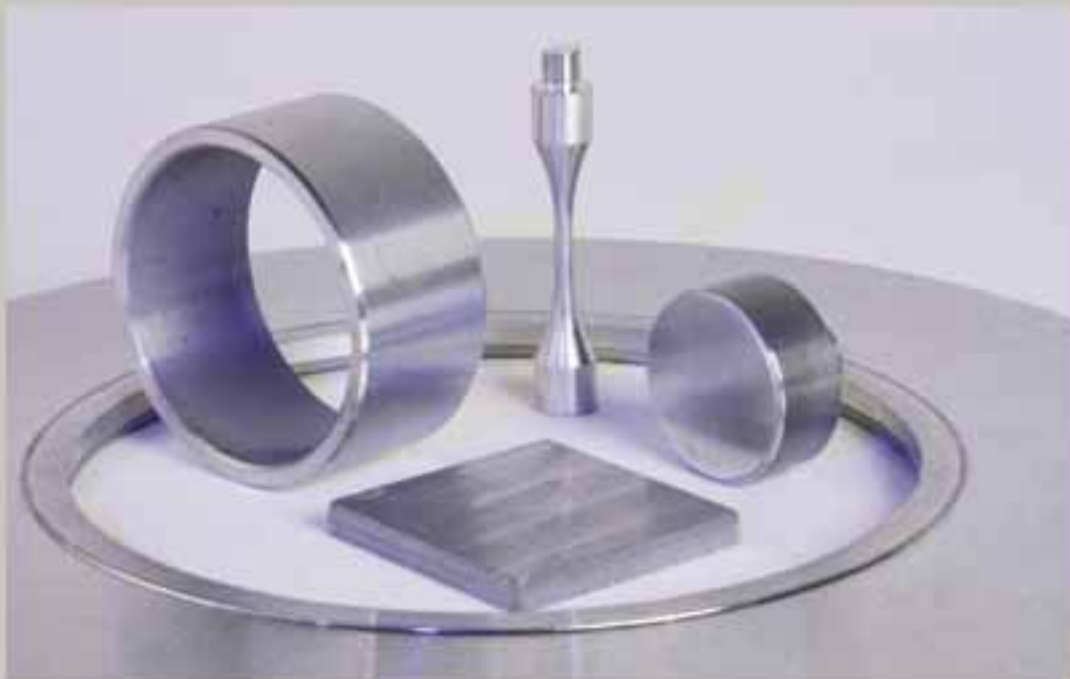


NASA PANEL

PERFORMANCE DRIVEN PARTS

MMC PRODUCTION PARTS

IPD does not stop at the prototype stage. REL excels at taking advanced technology developed in the lab into full scale production in a cost effective manner. MMC components offer distinct advantages over conventional materials. Contact REL for all of your MMC applications.



ADVANCED CERAMICS

REL has a state of the art facility for the production of various ceramic shapes. Ceramics are designed and tailored specifically to meet demanding customer applications. The REL team of ceramic experts have produced ceramic insulation for NASA shuttles and ceramic reinforcements for the production of aluminum and magnesium MMC components.





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