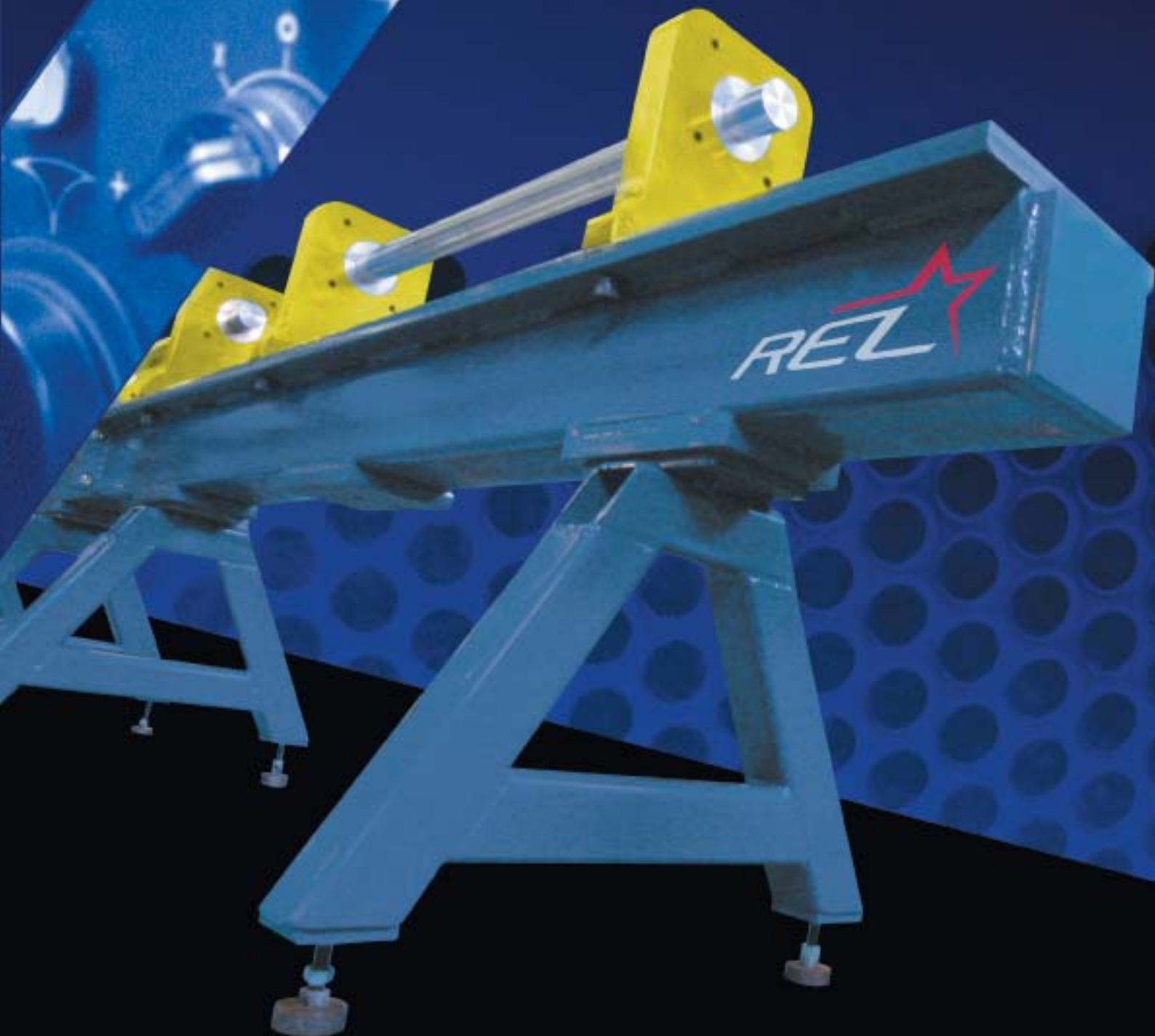


REL 



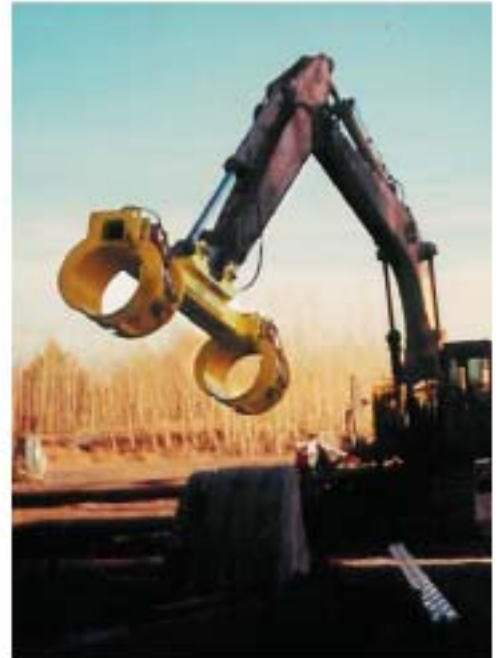
EQUIPMENT DESIGN AND BUILD



CUSTOM MANUFACTURING SYSTEMS

REL's 30 yrs of manufacturing experience has included the development of many custom manufacturing systems. From simple machining fixtures to ensure accuracy to advanced computer controlled machinery complete with robotics, REL combines practical designs with advanced engineering resources. Developing custom manufacturing equipment requires an understanding of the workflow, materials, and mechanics involved, in conjunction with controls and quality control technology. As a combined manufacturing/engineering organization, we are able to quickly understand the needs of our manufacturing customers and produce novel solutions that deliver reliable manufacturing and testing results.

Our team of engineers, fabricators, and machinists can take your project from concept and/or workflow layout in CAD to a completed piece of equipment debugged and ready for use out in the field or on your factory floor. For production equipment, our designs are suited for integration with your robotics and automation. For portable field equipment, REL can deliver a compact, efficient tool to meet your specialized need.



PRESSURE AND CAST SYSTEMS

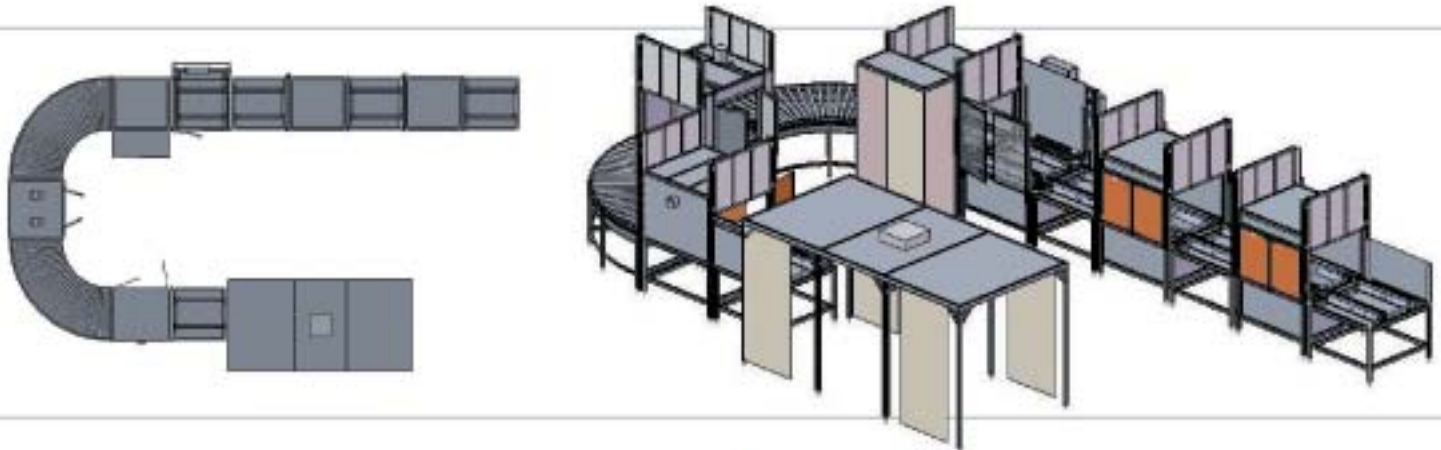
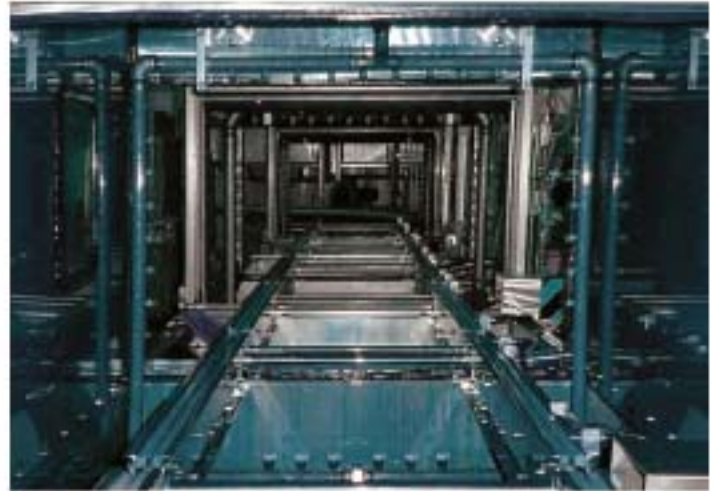
REL has developed advanced expertise in casting, machining, materials and machine design. With a vision to be the world leader in metal matrix composite solutions, it is essential to have an aluminum and magnesium squeeze casting machine with short-run production capability and state-of-the-art process control to be used in the development of cutting edge MMC product solutions. REL built a 1200 ton squeeze casting press in-house to manage this need. This machine has been used in providing casting services for Fortune 500 companies as well as research studies for the Department of Energy (DOE) and the American Foundry Society (AFS). REL's casting press offers precise process control for those attempting to develop MMC casting solutions. Partner with REL for your MMC needs and our expertise will complement the development of your new product throughout the entire deployment process.

THIS 1200 TON SQUEEZE CASTING PRESS WAS CUSTOM BUILT BY REL WITH SHORT-RUN AND STATE-OF-THE-ART PROCESS CONTROL CAPABILITIES IN MMC SOLUTIONS.

AREAS OF SPECIALIZATION

NON-DESTRUCTIVE TESTING

All critical aerospace components and some automotive parts must be non-destructively tested prior to use. The use of x-ray and ultrasonic techniques can be used to determine the presence of voids or porosity in casting and manufactured components. Surface cracks, however, cannot be detected by these methods. Fluorescent Penetrant Inspection (FPI) Systems are needed to inspect the surface imperfections to determine whether their size will have deleterious effects on the mechanical properties, especially the fatigue properties of final components. This inspection process is crucial when manufacturing components such as turbine blades for an aircraft.



A number of specified sizes of manual systems capable of preparing parts for FPI are available commercially today. REL's FPI systems are custom built per our customer's specific needs. REL's automated FPI systems are tailored for: part size and geometry, throughput (parts/hour) requirements, available floor space in plant, and the reduction of person/power goals for operation. A recent fully automated FPI system fabricated for a Fortune 500 company reduced the personnel requirements by six people. This was accomplished by the use of a PLC controlled fully automated system. Only one person was needed to load parts in one end of the FPI line and another person was required for visual inspection of parts at the end of the system. The throughput of this system with two employees was doubled even after five people were removed from the process by using an automated FPI system.

WORKING WITH REL FOR OUR NDT NEEDS HAS BEEN A PROFITABLE VENTURE FOR OUR PLANT. REL HAS DESIGNED AND BUILT A FULLY AUTOMATED FPI SYSTEM THAT HAS MET OUR EXPECTATIONS. THIS NDT CELL HAS REDUCED OUR LABOR COSTS SIGNIFICANTLY. THIS LINE ONLY REQUIRES TWO EMPLOYEES COMPARED TO FIVE ON A MANUAL LINE. WE WILL CONTINUE TO LOOK TO REL FOR OUR NDT AND AUTOMATION NEEDS."

Greg Shaw, Engineering Manager,
Howmet Castings, Hampton VA

INNOVATION - AUTOMATION - INTEGRATION

AUTOMATION

Workflow layout is crucial for optimum process efficiency in any application. Often, equipment footprints don't allow for optimum efficiencies due to periphery equipment that occupies valuable floor space. Recently, REL was tasked with fitting firing kilns into a plant with minimal floor space available. The Automated Batch Kilns were used to fire ceramics used in an MMC product. A unique lifting kiln design was incorporated into the manufacturing facility utilizing vertical space and thereby reducing the square footage needed by this cell. A PLC controls the ramp, soak time, and the cooling rates of the ceramic preforms as well as the mechanical lifting operation of the kilns.

ROBOT AUTOMATION

REL incorporates robotic equipment in the manufacturing process when it is a reasonable option, both financially and logistically. In today's global economy, reduction of labor associated with a manufactured component is paramount to cost reduction. REL's team of professionals analyzes the entire manufacturing process and determines trigger points for when robotics and automation can be incorporated to benefit your operation.



"REL'S ENGINEERS HAVE DESIGNED, MANUFACTURED AND SEAMLESSLY INTEGRATED A SET OF AUTOMATED BATCH KILNS INTO OUR PLANT (SEEN ABOVE) TO MAXIMIZE WORKFLOW EFFICIENCY AND TO MINIMIZE FLOOR SPACE REQUIREMENTS. WE WERE WORKING ON A COMPRESSED SCHEDULE AND REL DELIVERED AN INNOVATIVE SOLUTION THAT MET OUR DEADLINE AND PRODUCTION REQUIREMENTS."

Bob G. Coleman, Manager
FTF, LLC, Composite Brake Manufacturer

INNOVATION - AUTOMATION - INTEGRATION

INTEGRATED TEST EQUIPMENT

REL's materials group has developed an aluminum metal matrix composite brake rotor for use in motorcycle and commercial applications. With a revolutionary new material comes the need to test and retest until consistent performance is achieved. This process is extremely costly and time consuming to send out to an independent testing houses. REL sponsored a Michigan Tech University senior design team and worked in conjunction with the students to design and build a brake dynamometer. This was done initially to meet our internal brake testing needs for different size, geometry and composition variations for various braking applications. This piece of equipment is now

a showpiece of our many areas of expertise. This entails: Design and fabrication of the framework and mechanisms; coupling the motors and drives and hydraulic/pneumatic system; complete electrical design and automation controls; and overall packaging considerations. REL can deliver a complete equipment solution packaged in an efficient manner to minimize floor space requirements. REL now offers this as a fast turnaround, contract service for various brake manufacturers and researchers. This brake dynamometer has the full control and data logging capability found in commercial brake dynamometers.

COMPLETE ELECTRICAL DESIGN, WIRING, & AUTOMATION CONTROLS

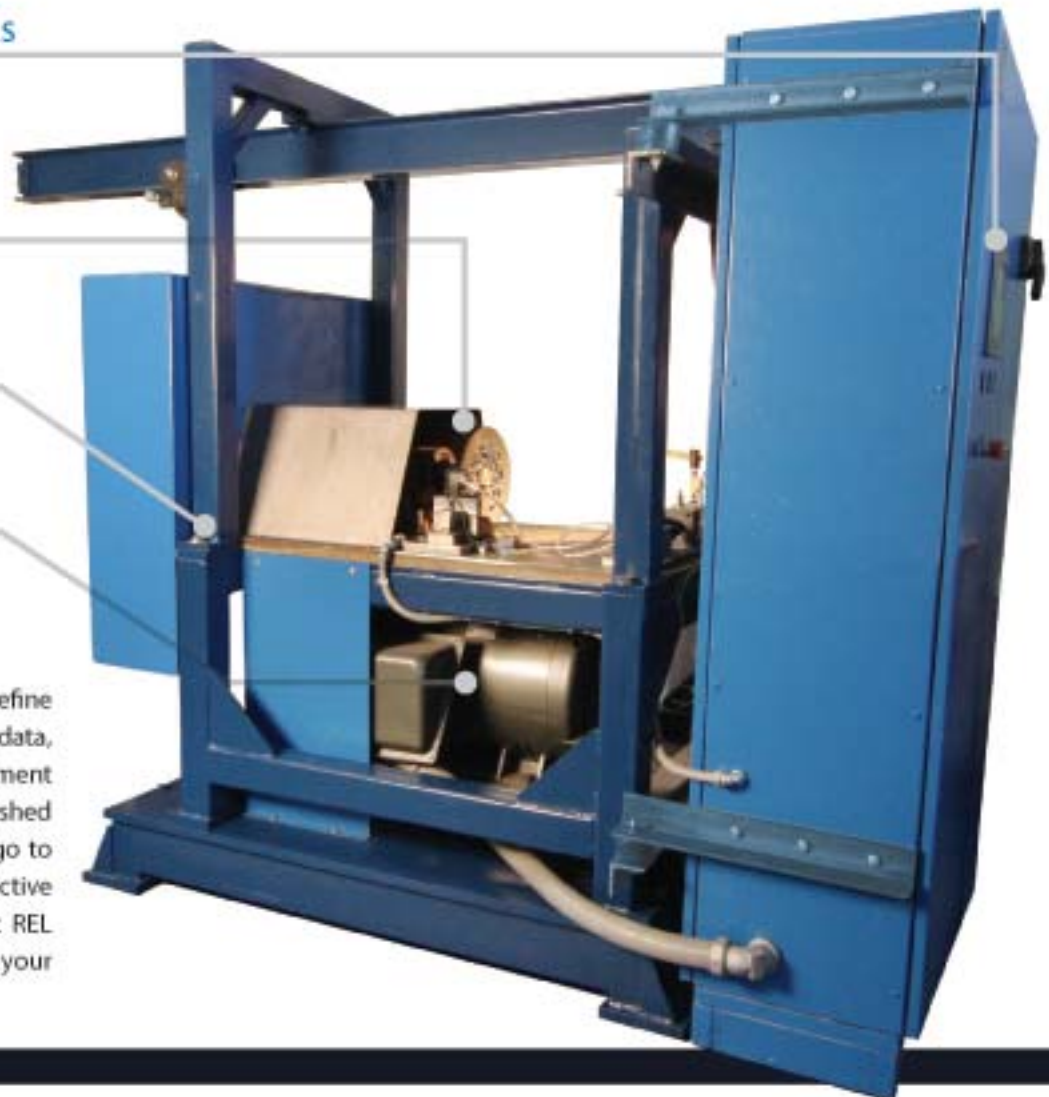
INTEGRATED SENSORS, DATA COLLECTION, & HYDRAULIC-PNEUMATICS

MECHANICAL DESIGN/ ANALYSIS & FABRICATION

INTEGRATED MOTORS, ACTUATORS, & CONTROLLERS

REQUEST A CONSULTATION

REL works closely with customers to define all parameters required for all inputs, data, and outputs associated with the equipment or process. Once these have been established REL's design and manufacturing teams go to work to deliver high quality, cost effective equipment or process solution. Contact REL for a free initial consultation to review your system requirements.





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