MINER ENTERPRISES INC.

RESEARCH & DEVELOPMENT

The Hidden Value Behind Every MINER Product.

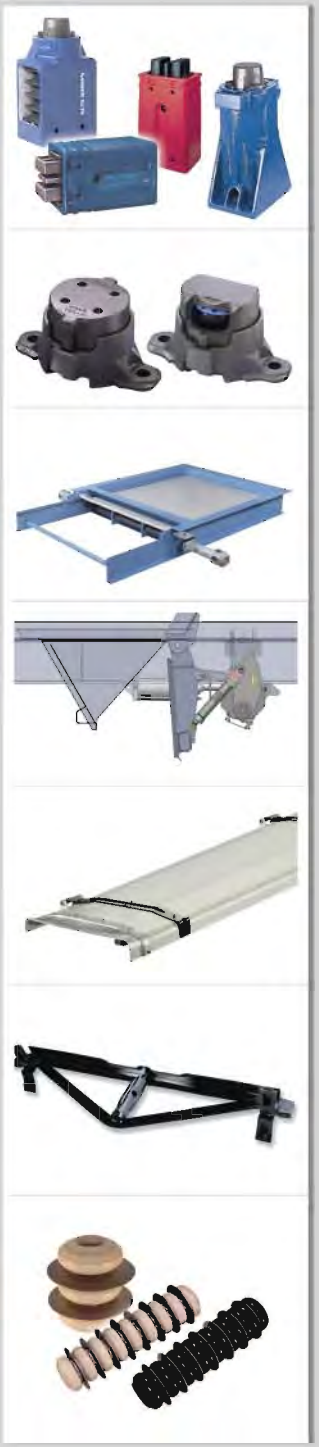
Miner Enterprises, Inc. is a premier supplier of freight car components to the railroad industry, serving its customers since 1894.

Throughout the years, Miner has made a strong commitment to support and expand the efforts of its Research & Development Department.

Located at the corporate headquarters in Geneva Illinois, the department provides the tools and skills required to improve, develop and certify, new and existing products for the entire product line.

Many of these test capabilities are also offered to our railroad customers, on a contract basis.

Celebrating 125 Years in 2019



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Miner's R&D Department offers one of the most complete supplier owned, AAR approved test facilities in the railroad industry. Consisting of a comprehensive physical test laboratory, a railcar impact track and the capability to perform unmanned field service testing, the department provides product development and quality assurance testing services for Miner's entire product line.

The department is staffed with engineers and technicians having years of expertise in instrumentation, stress analysis, load cell design and test machine/fixture design and fabrication.

The laboratory contains a wide variety of test machines and cycle machines, many built in-house to meet special requirements. All test machines are traceable to the National Institute of Standards and Technology.

IN-HOUSE CAPABILITIES PERFORMED BY EXPERIENCED MINER PERSONNEL

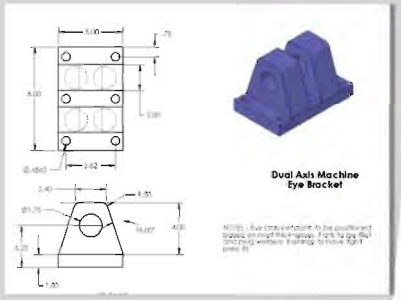
1. TEST MACHINE DESIGN
2. SITE PLANNING
3. PRECISION MACHINING
4. FABRICATION
5. CUTTING & WELDING
6. ELECTRICAL
7. PLUMBING
8. HYDRAULICS
9. ELECTRONIC CONTROLS
10. COMPUTER SYSTEMS - CONTROL PROGRAM DESIGN & CODING

Design & Fabrication of Test Fixtures and Machines

A key to a successful test is to start with a properly designed test fixture and/or machine for the test.

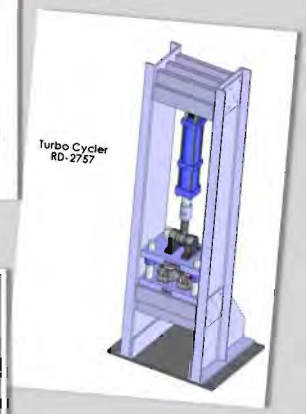
A competitive advantage for Miner is the ability to design and fabricate a fixture or a complete test machine, in-house.

Our In-House capabilities are essential tools in the timely development of new or improved products.



In-House Design Talent

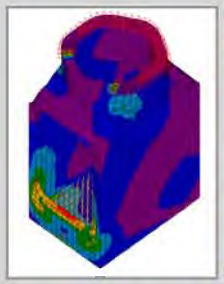
In-House Machine Shop

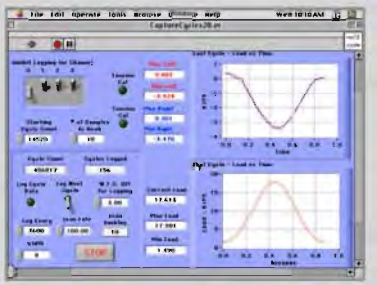


In-House Fabrication

Instrumentation and Analysis

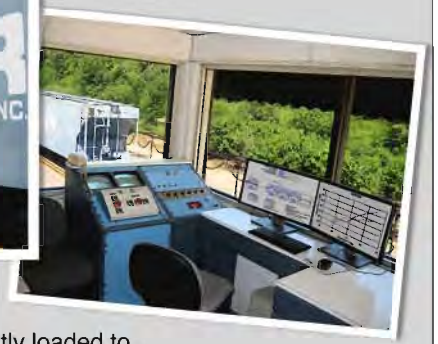
Measurements are the next key to a successful test. The department has years of expertise with the use of measurement and analysis tools such as load cells, strain gages, LVDTs and FEA modeling. Our data recording and machine control software is custom designed and coded, in-house using the industry standard National Instruments, LabVIEW software.





DYNAMIC TESTING

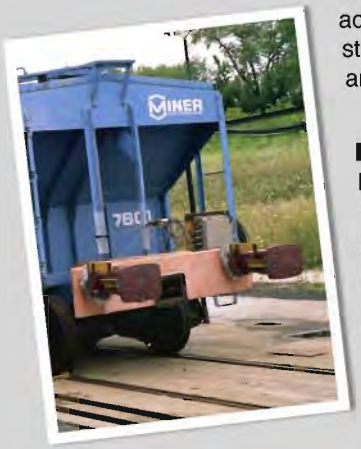
Dynamic testing is an important part of the product evaluation process. Its purpose ranges from rating performance and durability (drop Hammer), measuring product performance as applied to actual railcars (impact track) and measuring in-service performance (field testing).



RAILCAR IMPACT TEST TRACK

Miner owns several railcars which are permanently loaded to meet AAR test requirements. This facility is available to the industry for those looking to test railcars, railcar components and/or railcar commodities.

The incline ramp is capable of producing speeds of up to 16 miles per hour. A car tripping device placed at 1' intervals along the entire length of the ramp produces desired impact velocities to within 0.25 miles per hour. Miner's instrumentation cable trolley, provides 24 channels of dynamic data acquisition from either the moving car or the standing car. All impact test data is recorded and analyzed through a digital data acquisition system.



EUROPEAN BUFFER IMPACTS

European style railcars are available for testing Miner's line of buffers. The test car weights are adjustable from 27,000 to 106,000 pounds on the rails. Output from precision load cells and travel transducers is used to generate performance data from each impact, which is then applied to develop new products for the international market.

27,000 Pound Drop Hammer Test

Required to perform any AAR M-901 series draft gear testing, this test machine is used to determine draft gear performance and durability. The base of the machine is equipped with a 2,000,000 pound capacity load cell to measure reaction force. A laser displacement transducer is used to measure draft gear travel. The dedicated data acquisition system records output from the transducers, calculates the energy absorbed and presents the data in a graphical format.

Unmanned Field Service Testing

Although generally not offered to contract customers, R&D can perform unmanned field testing of new and existing products. This tool is used to fine tune and assure superior product performance and can also be used to better understand the environment our products are subjected to. Test data can be collected over a period of hours, days, weeks or months. Wireless communications are used to recover data remotely from anywhere in the United States, without leaving the office.

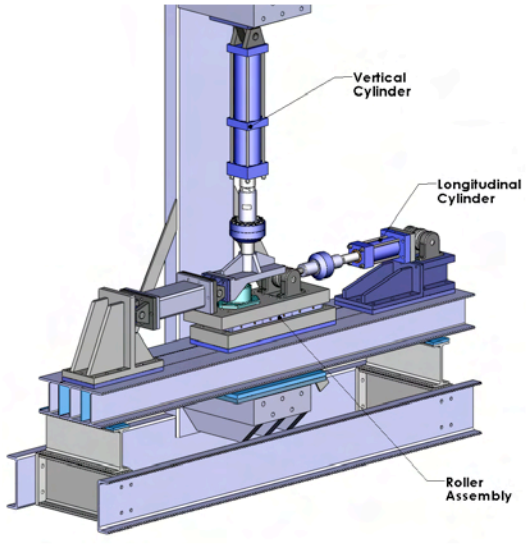
CYCLE TESTING

Whether its called endurance, life-cycle or fatigue testing, cycle testing is a tool designed to ensure product reliability and durability. The piece under test could be an entire assembled product or simply a single component of a product. This tool is used extensively throughout our entire product line, for quality assurance and product development purposes. Several of the cycle machines were custom designed and built, in-house to provide a specific capability. The control systems were also designed and coded in-house using National Instruments LabVIEW software.

400K Cycle Machine

Generally used to cycle test individual product components. Pictured, is the 1,000,000 cycle, draft gear rear wall cycle test.

Turbo Cycler

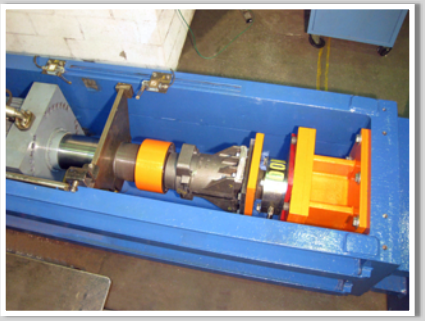


Dual Axis Cycler

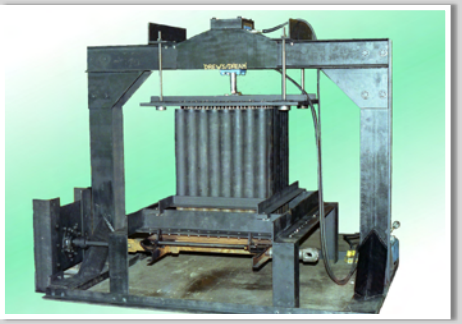
Vertical Cycler
with Thermal Chamber

The Turbo, Dual Axis and Vertical cycler trio, were initially purpose built, in-house to perform sections of AAR Specification M-948 for side bearings. With special designed fixtures, each machine has been used to test a variety of components from other products. The Vertical Cycler has the unique ability to cycle test pieces at temperatures ranging between -50°F and +150°F through the use of the integrated thermal chamber.

Brake Beam Cycle Machine
Dedicated to performing the 1,000,000 cycle test of AAR Specification S-344.



Horizontal Cycle Machine
Ideal for cycling draft gear and European buffers in the orientation they are used.



Slide Gate Cycle Machine
Dedicated to performing the 1,000 cycle test of AAR Specification S-233.

10 Station Cycle Machine
Purpose built machine for quality assurance testing of individual draft gear pads. The carousel indexes a pad over the loading ram, cycles the pad once, then indexes to the next station.

Not Shown

Hatch Cover Cycle Test Stand
Dedicated to performing the 1,000 drop test of AAR Specification S-2037.

STATIC LOAD TESTING

Static load testing can come in many forms. The machines available cover a wide range of loads, all the way to 1,000,000 pounds in both tension and compression. All laboratory machines are calibrated annually and are traceable to the National Institute of Standards and Technology.

These are truly the most versatile machines, their most frequent uses are; calibration of load cells such as our dynamometer couplers, quality assurance calibration of our product's spring components, load to failure tests and instrumented load tests such as a strain gaged product component.

160,000 Pound Capacity

1,000,000 Pound Capacity

300,000 Pound Capacity

Showing Load Cell Calibration in Tension

Universal Static Tension/Compression Machines

Three different size test machines are available, having maximum capacities of 160,000, 300,000 and 1,000,000 pounds. The machines are selected for use based on the load requirements and the size of the piece to be loaded. All three machines are variable speed screw driven machines which allow for a test load to be applied for extended periods of time with the machine de-energized. These machines are fully instrumented and each has a dedicated workstation that records, processes and prints test data.

The Verson Static Test Machine

The Verson static test machine can produce a compressive load of 1,000,000 pounds. It is a hydraulic machine which is used to perform many 'Test to Failure' tests.

The machine is also used to perform the popular Rail Bend test for our contract customers.

Brake Beam Static Load Test Stand

Used to perform the static load portion of AAR Specification S-344. Test loads are applied via hydraulic cylinders, and are measured using precision load cells.

Thermal Chambers

Five chambers of various sizes and ranges are available. Temperature ranges from -80°F to +750°F are possible, for items as large as a railcar coupler. -100°F is possible for smaller sized items.

RailBend Testing

Among the many contract services offered is slow bend testing of electric flash butt and thermite welded rail. Miner has provided this service for more than 40 years. Its customers include major railroads, transit authorities and the TTCI (AAR). Slow bend testing is conducted in accordance with AREA and AWS Specifications.

Railcar Compression Fixture

Often used as a precursor to railcar impact testing, the the 1,000,000 pound "Squeeze" machine will accept test cars in lengths from 45 to 119 feet.

Hydraulics are used to apply the test loads which are measured by a precision load cell. The data acquisition system can scan and record up to 100 data channels, providing on-the-spot analysis in tabular and graphic formats.

Coupler Vertical Load Tests

Required by some AAR specifications, this test applies jacking loads at the coupler shank and pulling face areas.

Additional Static Test Capabilities include railcar weighing and railcar twist & stiffness tests.

Impact Track Back-Stop

Hydraulic and crushable media shock absorbing devices can be tested against this back stop which is secured to the impact track pad.

Rolling mass weights from 13,000 to 106,000 pounds are available to match each test requirement.

Dynamometer Coupler - Services

Dynamometer couplers are used to record reaction force during in-train service or railcar impact testing. Miner R&D has offered dynamometer coupler sales, repair and calibration services to the rail industry for over 50 years.

The Miner designed dynamometer is constructed using high tensile solid shank coupler blanks. The construction process includes machining the blanks, strain gage instrumenting, weather proofing and calibration. Both tension and compression calibrations are offered. Recommended calibration frequency is every 6 to 12 months, or before use.

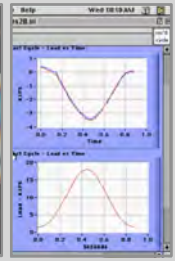
In addition, many standard couplers and drawbars can be strain gaged and calibrated to sense load.

NOTE:
Contract customers can purchase machine time to calibrate their load cells and/or measurement equipment.

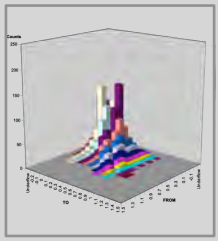




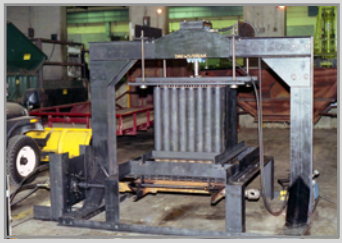





ONE TEST IS WORTH A THOUSAND EXPERT OPINIONS



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