

A view inside the high bay area of our Columbus Plant in which autoclaves are built. A large, well-equipped steel fabrication facility qualified to do nuclear work.

Autoclave capital of the industry! That's how United McGill's management looks at Columbus, Ohio. Because Columbus is the headquarters for the foremost manufacturer of Autoclave Systems.

The sales of United McGill Autoclaves stretch around the globe with systems in Australia, Brazil, Canada, England, India, Indonesia, Iran, Luxemburg, S. Africa, United States, Venezuela and Zambia.

And, our Autoclave Systems hold a unique marketing position. They are the standard of various industries such as aircraft and aerospace, tire and rubber products, laminated safety glass and ore beneficiation.

In each case these industries have come to rely on United McGill because of rigid design and production stand-

ards which result in products that meet the most stringent requirements of quality...standards set by the ASME Code and United McGill's own Quality Assurance Program.

Part of this Quality Assurance Program is evident by the fact that United McGill has professional engineers and skilled craftsmen working together to design, manufacture and install advanced products and systems.

We also maintain a field service organization to provide service support for our products and continually look for ways to improve product performance.

The development of United McGill is a prime example of an American industrial success story. Beginning in 1951 as United Sheet Metal and Engineering Co., the company has

grown tremendously over the past twenty-five years.

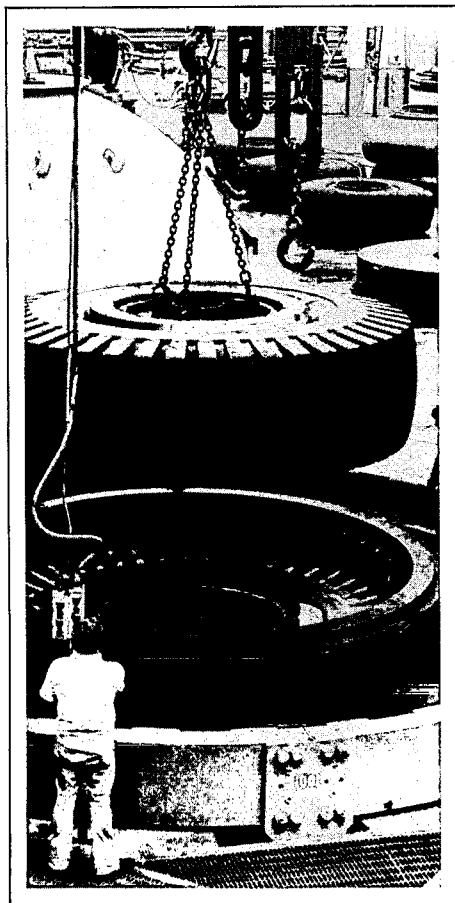
Today, United McGill has five manufacturing facilities, employs over 800 people and is a single, responsible source for a wide variety of industrial needs--a pioneer and leader in the development of a broad spectrum of products and services such as United Electrostatic Precipitators, United Flo-tation Systems, United Interlock Grating, United Sheet Metal and United General Fabrication.

United McGill
Corporation

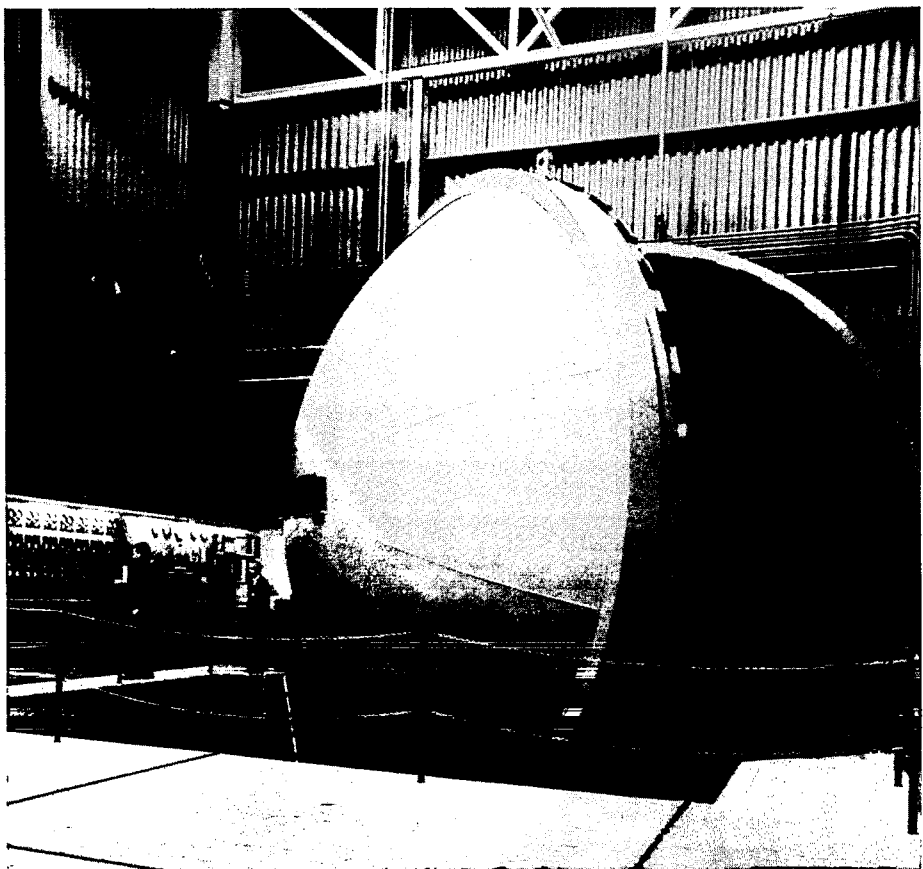
McGill Autoclave Systems

2400 Fairwood Ave., P.O. Box 820, Columbus, OH 43216
614/443-0192, Telex: 245-384

introduction to autoclaves



This picture illustrates the largest tire curing press in the world. Designed, manufactured and installed by United McGill, it stands 49' [14,940 mm] tall and can produce tires 17' [5180 mm] in diameter.



The world's largest autoclave system, engineered and installed by United McGill. Aircraft parts are bonded under pressure up to 200 psi and temperatures to 800°F. in the 21' [6400 mm] diameter by 55' [16,760 mm] long workspace. At left is a UM autoclave control and instrumentation system, housed in a 40' [12,200 mm] long console.

Many industrial processes require properly controlled conditions of heat, pressure and/or vacuum to cause physical and chemical changes on a material to be treated.

These conditions are created and controlled within enclosed vessels, generally called *autoclaves*.

Autoclaves vary in size from the household pressure cooker and compact sterilizing units used in laboratories and hospitals to huge structures such as the world's largest tire curing press that can produce tires 17 feet (5180mm) in diameter.

Autoclaves are often called by other names for specialized functions or industries:

- *Vulcanizers, Devulcanizers, Heater Presses and Tire Curing Presses* are used in the rubber industry.
- *Globe Digesters* are used in the

pulp, paper and minerals industries.

- *Sterilizers, and Hyperbaric Chambers* are used in the medical field.
- *Pressure Cookers* are used in the food industry.
- *Impregnators* are used for putting one material into another, such as preservatives into wood, or for treating paper pulp tubes, porous castings and insulation of electrical cable.
- *Laminators and Bonding Autoclaves* are used for safety glass and structural composites in the aircraft industry.
- Autoclaves are also used for chemical reactors and chemical synthesis.

The pressure vessel is only part of the autoclaving process. Sophisticated equipment is also required for convenient materials handling, proper supply and application of process heat,

pressure, and/or vacuum and adequate process control, instrumentation and valving.

United McGill has made a specialty of supplying integrated autoclave systems to meet the specific needs of the processing industries.

We have designed, engineered, manufactured and installed some of the largest and most advanced autoclave systems in the world...complete packaged units including pressure vessels, quick opening doors, heating, cooling and air circulation systems, provision for materials handling, instrumentation and completely automated process cycling.

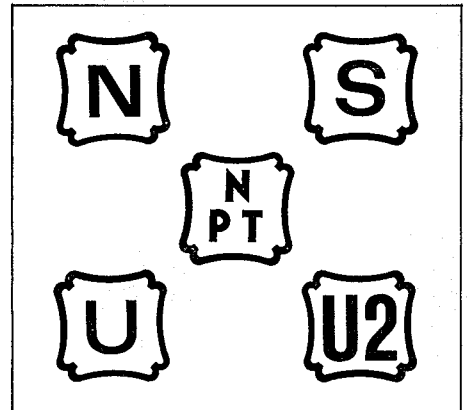
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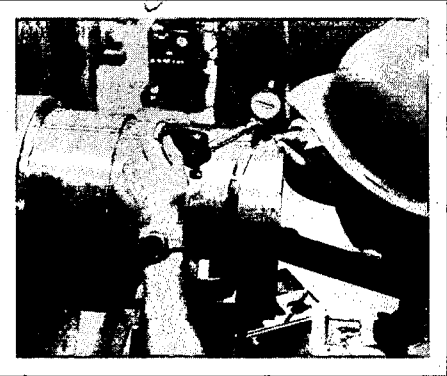
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A portion of UM's Design and Process Control Engineering Department in Columbus.



Code symbols designating categories of vessels and systems which UM is authorized to design and fabricate.



In-process inspection of a rotary globe digester assures conformance to detailed design throughout manufacturing.

All United McGill pressure containing units and components are designed to exceed the requirements of the ASME Code.

Manufacturing procedures, materials and testing equipment assure Code compliance, operational safety and functional soundness of United McGill's Autoclave Systems.

A complete design staff is maintained to assure strict adherence to Code requirements and to provide proper interpretation of design specifications and requirements into correct hardware. Construction, materials, design and testing are meticulously checked by an authorized ASME Code inspector.

Of course, extensive design capability is demonstrated by United McGill's Nuclear and "U2" certification. Detailed design calculations are also generated to support Section VIII, Division 1 constructions, as applicable.

Following are the categories of vessels and systems designed and fabricated by United Autoclave Systems:

ASME Section I—Power Boilers "S" Class

ASME Section III—Nuclear Power Plant Components, Division 1

"N" Class 1,2,3, Vessels

"N" Class 2 & 3 Storage Vessels

"NPT" Class 1,2,3 Component Supports and Vessel Parts

"NPT" Class MC Penetration Assemblies

ASME Section VIII—Divisions 1 & 2

("U" & "U2") Unfired Pressure Vessels

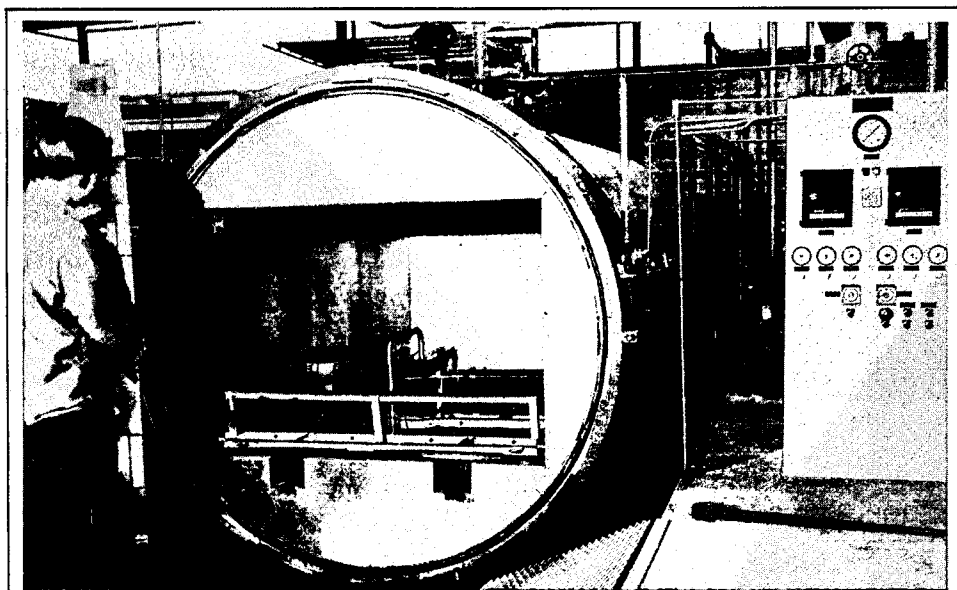
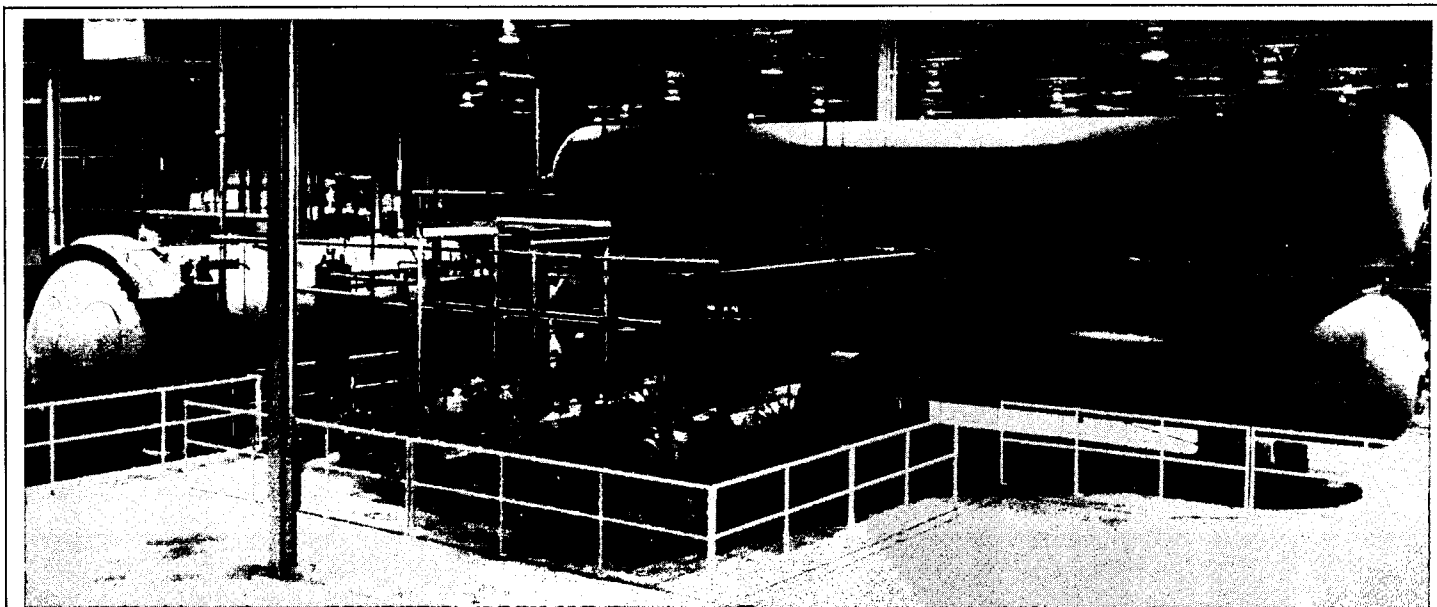
ASME Section IX—Welding and Brazing

United McGill's Quality Assurance Program meets these ASME requirements. It also meets accepted stringent requirements of Quality Assurance Criteria for Nuclear Power Plants for equipment supply to the nuclear power industry.

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Small and medium sized hot-air glass lamination autoclave systems. A larger system, capable of producing 5 million automotive windshields per year is presently being designed, manufactured and installed by United McGill.

The most advanced method of "Laminating" (joining layers by the action of heat and pressure) is in an air autoclave.

Laminated glass, used extensively for automotive windshields, bullet proof glass, aircraft windshields, architectural glass and solar receiver mirrors, consists of thin layer(s) of plastic sandwiched between layers of glass. Pressure and high temperature generated and controlled by an autoclave, uniformly bonds the glass and plastic surfaces.

United McGill's hot pressurized air process has become the standard of the automotive and architectural laminated, safety glass industry. This process allows for total, precise control of temperature and pressure set points and rates.

A new development by our Research and Development and Process Engineering Group enables direct monitoring of glass centerline temperature. This feature not only allows for precise establishment of cycle termination point, but saves time and totally

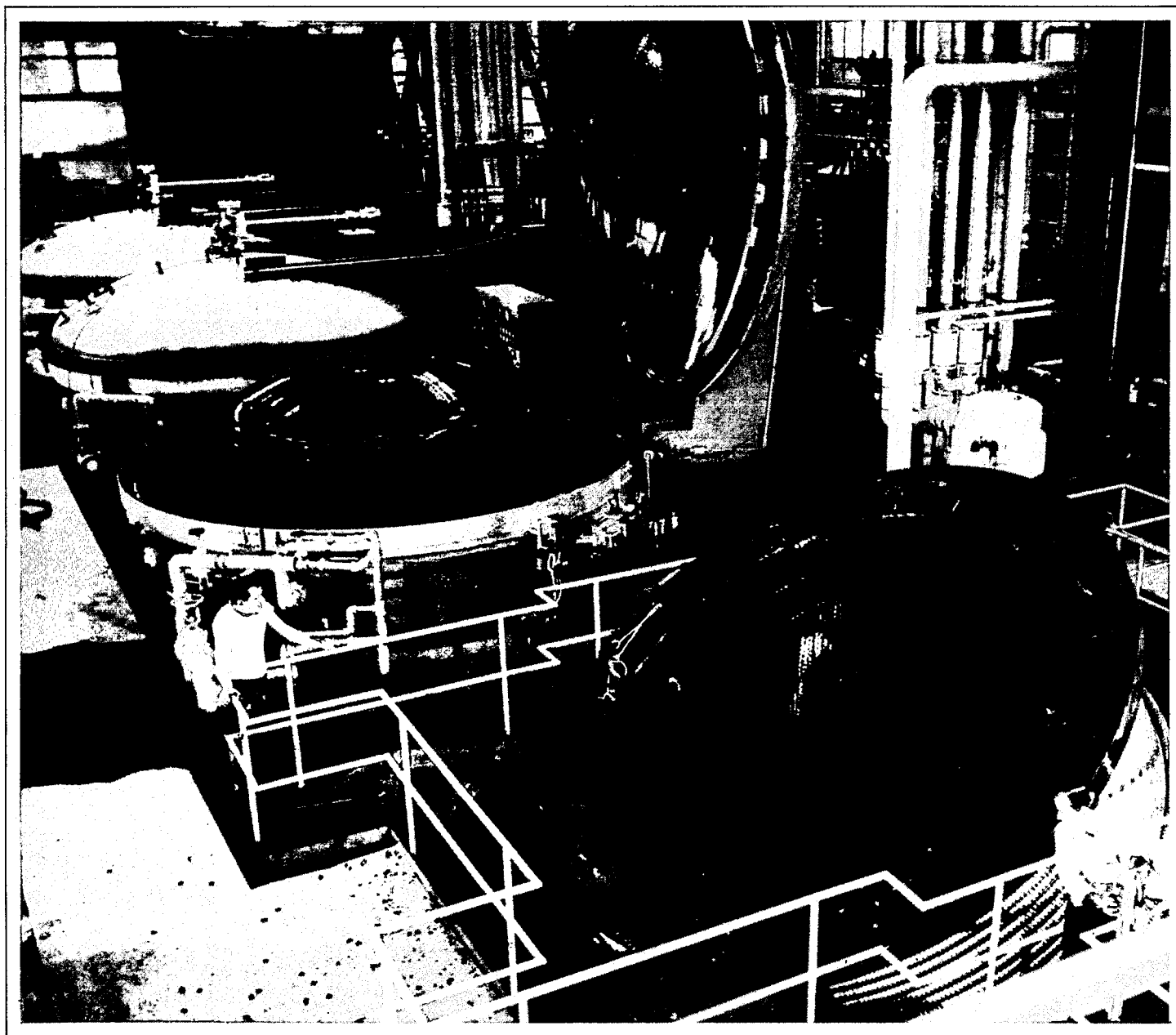
eliminates guesswork. Advances have also been made in uniformity of air distribution (i.e., temperature uniformity) over complex shapes.

Cycle time and product quality are now optimized by virtue of the unique features available in the United Autoclave Systems Glass Lamination process.

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A principle cable manufacturer impregnating transoceanic communications cable with protective oil.

The technology of improving the operating characteristics, integrity and strength of many commonly used products by pressure impregnating them with another material is important in many of today's industrial applications.

Power carrying capacity of electrical stranded and insulated cable is increased many times when air is excluded from the product and replaced with oil by pressure and heat treatment.

Performance and working life of motors and transformers is greatly improved by impregnating the motor windings and transformer coils with a resin.

Porous castings are made leakproof by the same process, using sodium silicate and other impregnates.

Low cost paper pulp tubes become leakproof liquid handling pipe when impregnated with pitch and cured.

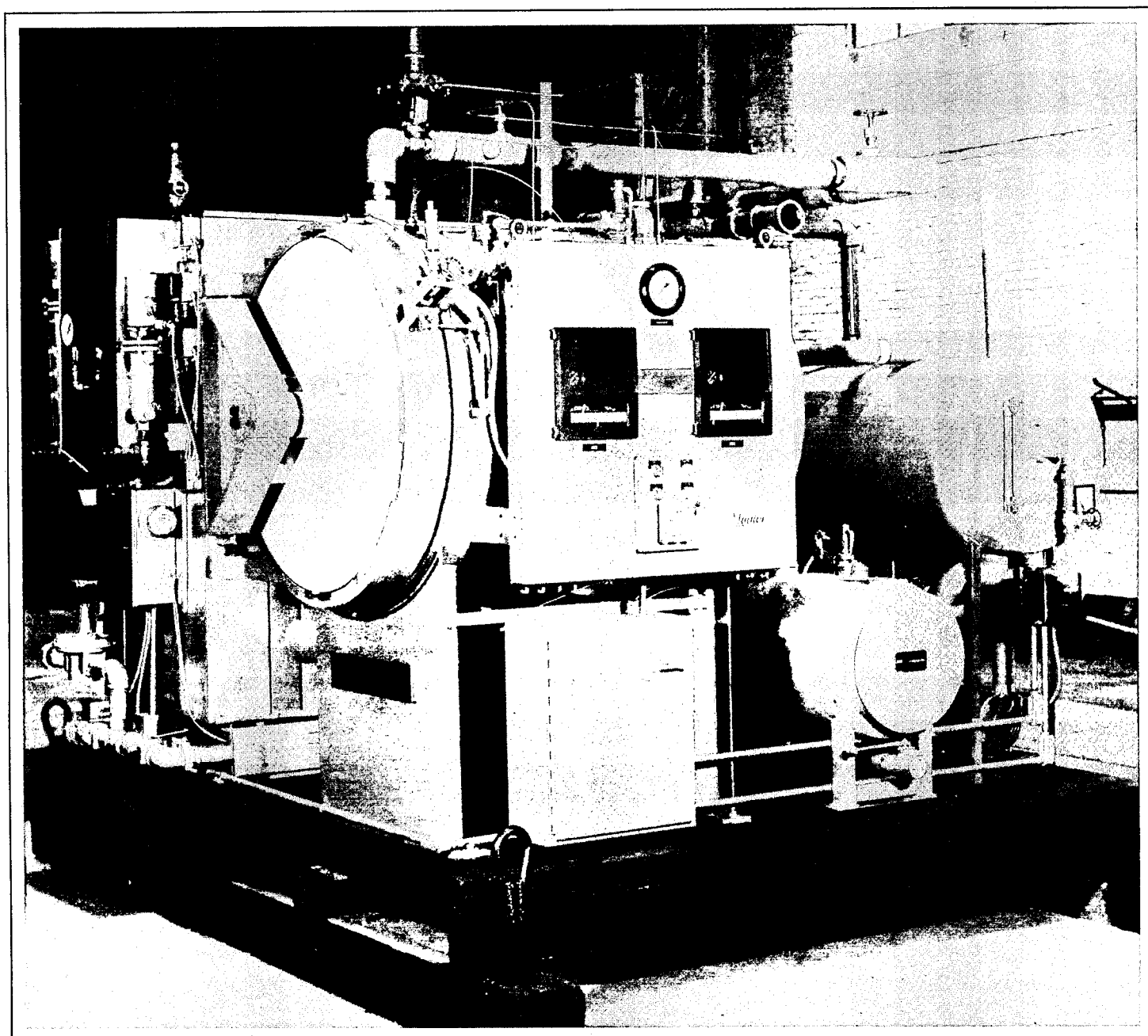
Wood is pressure treated for longevity and fire retardance.

These and other processes fall among United McGill's variety of important contributions to Vacuum-Pressure Impregnation Systems used for low cost improvement of product quality and usefulness in American industry. A system can be designed to meet your specific requirements.

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A UM packaged steam autoclave system for dewaxing investment casting molds.

Processes for the production of close tolerance castings of various metals and alloys utilize the injection molding of precision wax patterns.

The wax patterns are dipped (invested) into fine sand molds. Removal of wax to provide the close tolerance casting cavity requires a carefully controlled heating process integrated with high-speed pressurization and precision depressurization.

United McGill's complete packaged

system for dewaxing of investment casting molds provides the precise control of high temperatures and pressure conditions necessary for the rapid melting of wax patterns. Wax collection is easier and air and water pollution is minimized.

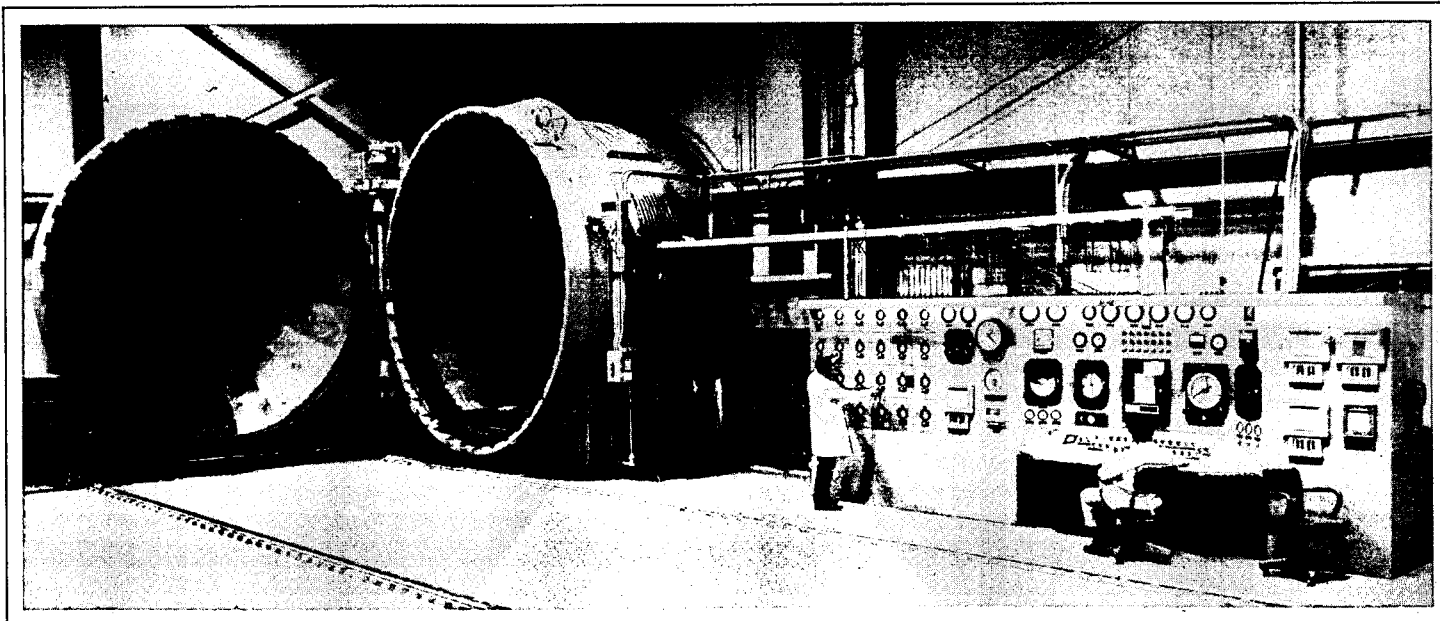
United McGill's dewaxing system includes an ASME Code designed autoclave, packaged boiler with full accessories, push button control console, wax recovery tank and complete

valving, piping and wiring for tie-in to plant utilities. Standard sizes are available, or we will be happy to discuss a system to meet your specific requirements.

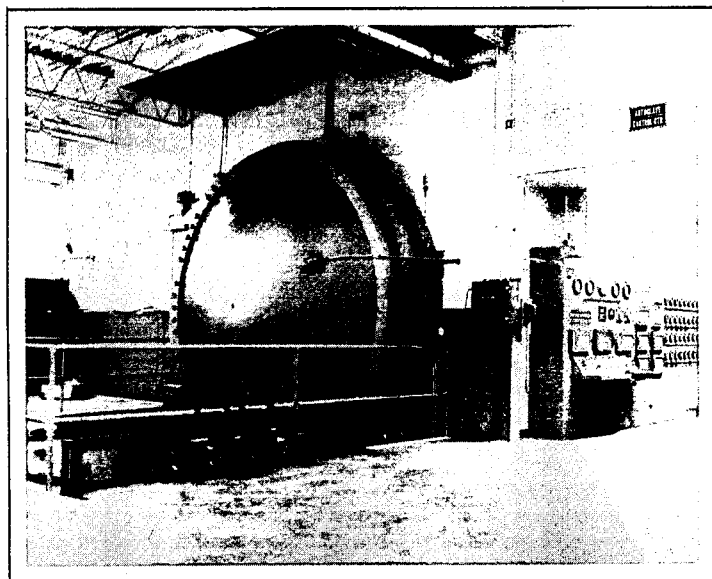
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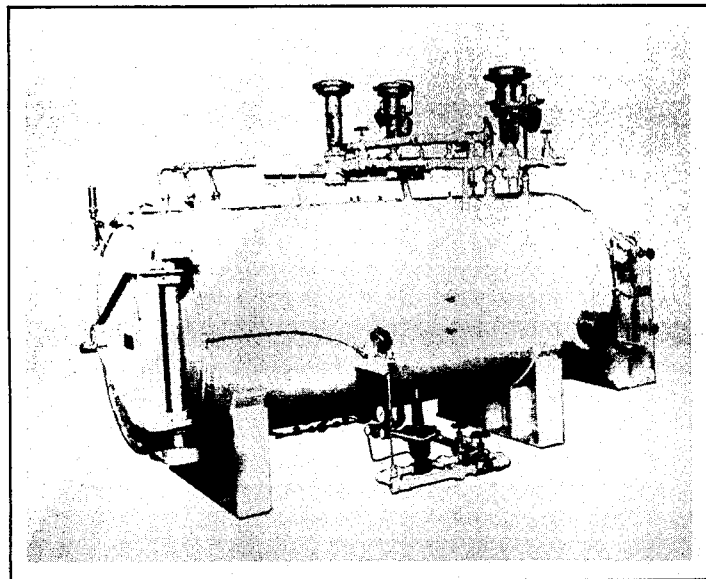
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One of two UM autoclaves used to bond graphite-titanium alloy composite structures of the F-15 "Eagle" Air Superiority Fighter.



This UM autoclave is used for bonding components of commercial jet aircraft.



A lab autoclave for prototype and quality control work in aerospace bonding.

Increased payload-to-power ratio requirements in the aerospace industry have produced a need for lighter weight materials and stronger structures.

These needs have resulted in an entire spectrum of new composite structures fabricated from aluminum, stainless steel and titanium. Glass, boron or graphite fibers are also combined with epoxy, polyamide or polyimide resins to form the Advanced Composites.

These integrally cured honeycomb

and built-up assemblies require precise treatment with pressure and dry heat to give high strength/stiffness to weight ratios. The autoclave approach has been selected by the leaders in the composite materials industry as providing the most versatile means of allowing for lighter weight molding forms, handling of more intricate shapes and uniform heating and cooling.

For nearly 25 years, United McGill has provided innovative design and control features in Bonding and

Pressing Autoclave Systems including the development of direct glue line temperature sensing. We also maintain a Research and Development facility which includes an Air Flow Model Test Laboratory. Advances have been made in uniformity of air distribution (i.e., temperature uniformity) over complex shapes.

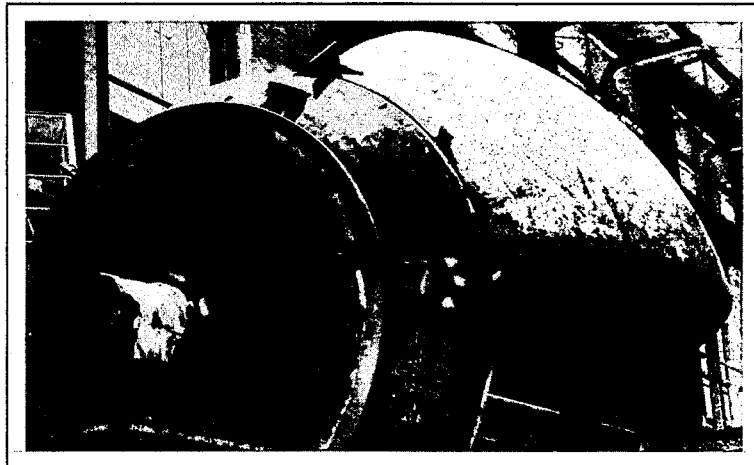
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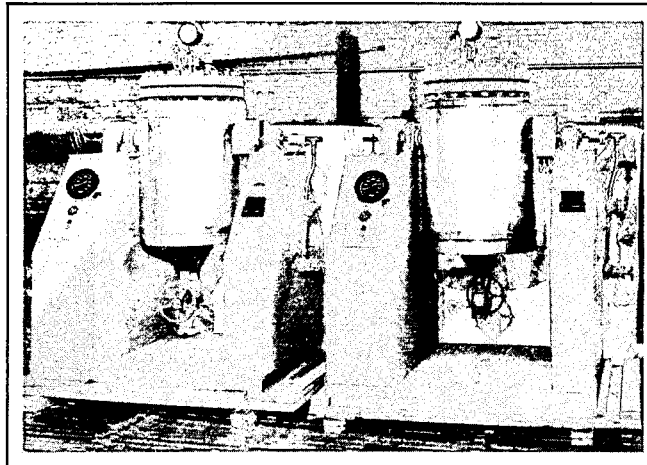
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UM Rotary Globe digesters being used to extract TiO_2 from ilmenite, a titanium bearing ore. TiO_2 pigment is used in plastics, rubber, paper and textile. These digesters are part of the closed cycle-environmentally clean process, patented world wide by Benilite Corporation of America.



A rotary globe digester being fitted to form the final sphere. Eventually this digester will be used to digest scrap leather into protein.



A rotary/cylindrical processor with cooling jacket.

A number of chemical leach and extracting processes are performed in rotating spherical pressure vessels called Rotary Globe Digesters.

Reaction rates are enhanced by the increased pressure and unique blending and folding type of agitation that occurs in a rotating sphere.

Low grade ores are improved by the acid or caustic leaching of impurities from the ground material. In other cases, desired materials are dissolved and removed in the liquid phase.

Materials normally subject to size degradation or caking can be successfully blended and dried in a rotary globe vessel.

Products processed in rotary digesters are:

- Ores
- Paper (fine, long fiber)
- Fibrous materials
- Proteins and long chain, shear sensitive materials

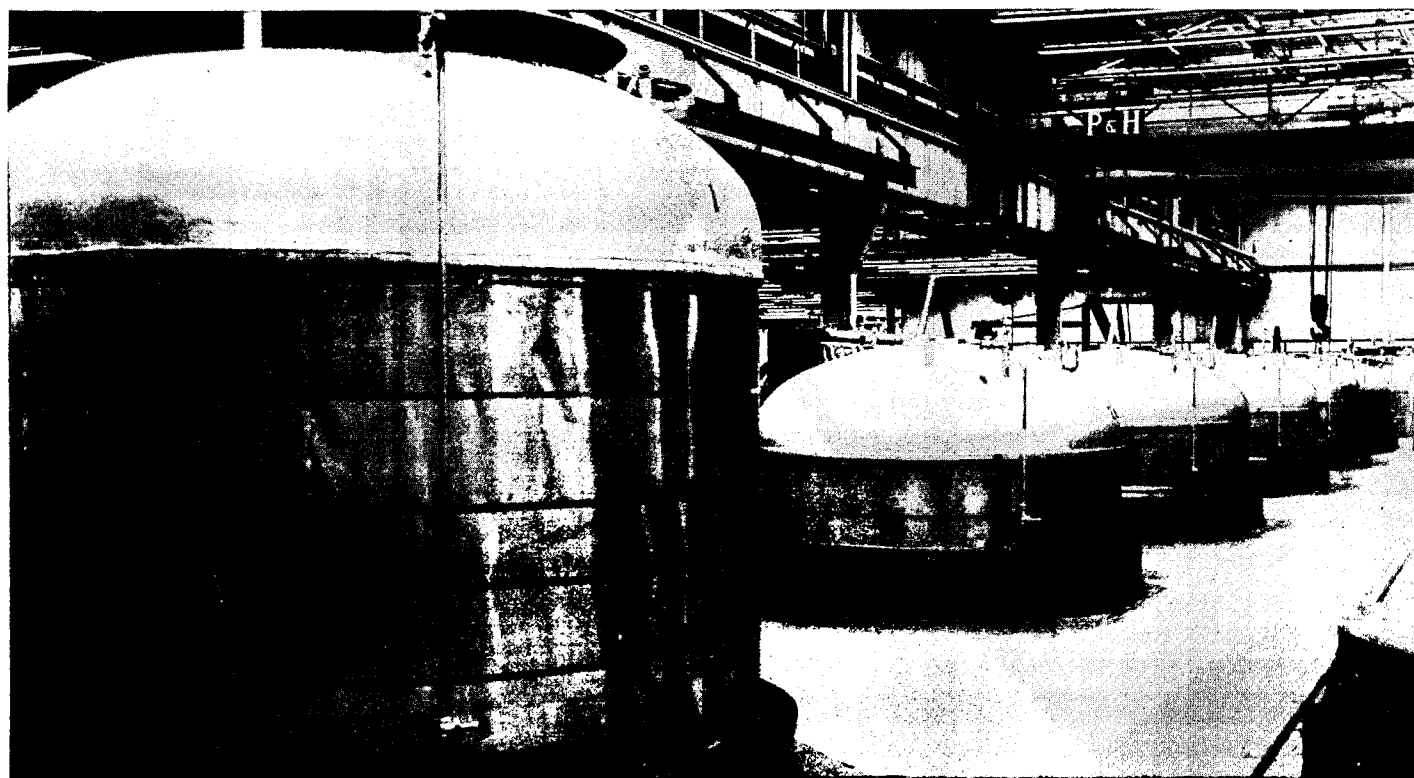
United McGill's Rotary Globe Digesters offer the versatility of temper-

ature, pressure (vacuum) and mixing control and the reliability required to withstand hostile environments of simultaneously applied high temperature, high pressure and acid/alkaline solutions. Sizes up to 20 feet (6100 mm) in diameter have been supplied.

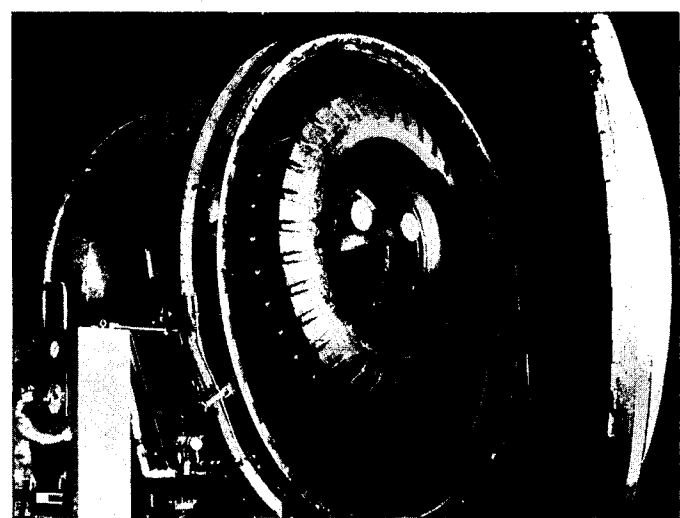
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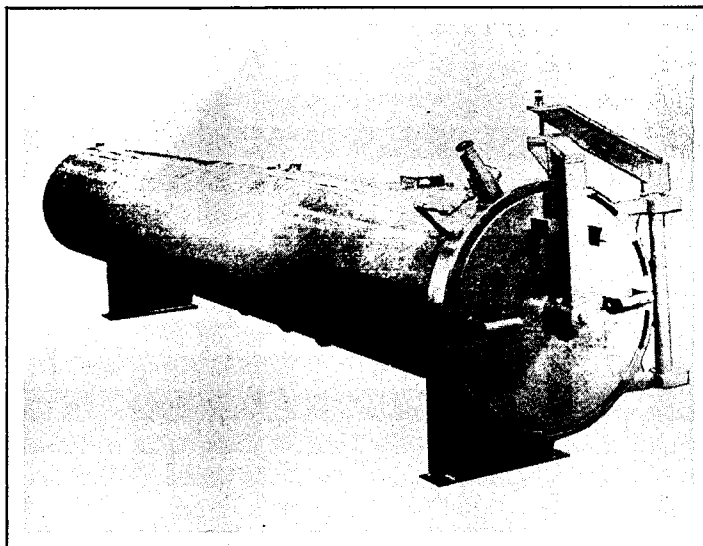
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A major earthmover tire factory showing some of the fifteen United McGill heater presses in 120" [3050 mm], 134" [3400 mm] and 180" [4570 mm] sizes.



A 180" [4570 mm] Unicapper™ largest in the world. A completely automated, packaged system for retreading and miscellaneous repairs on large size tires



A United McGill live steam vulcanizer for rubber processing and curing.

The most widespread use of autoclaves is found in the molding of rubber and plastics.

The elastomer product preparation is placed in molds on forms, mandrels or frames. It is then subjected to the steam pressure necessary to give temperatures capable of causing the

desired chemical and physical change in the product to attain the desired degree of elasticity, strength and hardness.

Almost every variety of rubber, plastic, cork or similar material can be autoclaved to attain the desired cure.

United McGill Corporation is the

world's leading firm in the design, manufacture and installation of Rubber Curing Systems.

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