

"Leave the dreams of yesterday, take the torch of knowledge, and build the dreams of the future."

MARIE CURIE

ENGINEERING CAPABILITIES

Effective design
solutions to special
problems.



Henderson Industries is an engineering firm specializing in the design of customized systems for a broad range of industries and applications.

Varied and extensive experience is our greatest strength – a strength that makes us uniquely qualified to solve your problems . . . with efficient, innovative systems.

Our systems and products are not mass-produced or plucked off a shelf. Each project – from the smallest component to the most complex turnkey system – is carefully designed to meet your needs and specifications. Henderson's design services range from fundamental research

and development, to feasibility studies and preliminary sketches, to full functional specifications and final ready-for-production designs. And all of it done to fit your budget . . . and your deadlines!

Henderson offers you unequalled expertise in these four basic engineering disciplines:

- **MECHANICAL.** We engineer systems that weigh, blend, handle, measure, and mix powders and fluids in a wide variety of process and packaging applications. Our projects in this area include material handling systems . . . batching systems . . . weighing systems . . . container and bag filling systems . . . industrial robots . . . and more. We also have expertise in the mechanical packaging of electronic assemblies.
- **ELECTRICAL.** We know how to design control systems utilizing programmed logic controllers, relays, timers, motor starters, variable speed drives, and other control components. Henderson routinely designs systems to the exacting code requirements of the National Electrical Code, Underwriters Laboratory, Factory Mutual, and other industry standards. Plus, we have extensive experience designing

electrical systems for use in hazardous environments, such as explosive and nuclear.

- **ELECTRONICS.** We're at home with very small components as well as very large ones. Our engineering team has decades of experience in analog, digital, and radio-frequency circuit design, and we've designed dozens of sophisticated electronic systems and components. These include: amplifiers and filters for millivolt-level signals produced by strain-gauge load cells used in the weighing process . . . EMI/RFI suppression . . . hybrid analog/digital systems . . . RF circuits for communication and navigation . . . RF power amplifiers . . . HF, VHF, and UHF oscillators, amplifiers, and related signal-processing and RF distribution hardware . . . printed circuit-boards . . . and much, much more.

- **COMPUTER SCIENCE.** Our programmers and systems analysts develop real-time applications in a variety of modular, structured, high-level programming languages and data management software. The computer-based systems we have designed use the Intel Multibus or STD, VME, or S-100 bus. Our data communications interfaces comply with EIA, ANSI, and FIPS PUBS where appropriate.

"If it be verily well designed; it must answer this purpose in the simplest way, and with no over-expenditure of means."

JOHN RUSKIN

We have extensive experience designing with the Intel, Motorola, and DEC processors. In addition, we design customized interfaces when standard interfaces can't do the job. Our computer scientists have systems experience integrating communications and control utilizing local area networks.

A wide range of experience

Henderson's portfolio of assignments is unusually broad, everything from robots and the space program, to military electronics and navigation systems, to industrial process control and instrumentation. We will draw on this experience every time you put us to work for you.

Here's just a sampling of some of the recent projects awarded to Henderson Industries:

- **SPACE SHUTTLE.** Henderson Industries designed and produced an automated weighing and materials handling system used to prepare insulating material for the exterior surface of the fuel tank portion of the space shuttle's lift-off power cluster. The

Henderson system provides accurate preparation of the ablative insulation material which maintains the critical temperature of the liquid oxygen and liquid hydrogen inside the fuel cell. On this project, Henderson Industries received a Manned Flight Awareness Award for on-time delivery.

- **DVOR.** Henderson Industries developed a Doppler VOR (very high frequency omnirange navigation system) for the U.S. Federal Aviation Administration. This design utilized high-power VMOS RF power-switching and commutation plus sophisticated digital/analog computer-controlled RF signal processing for high precision and stability.

- **ROBOT CONTROL LANGUAGE.** As part of our continuing development of robotics technology, we've created a Robot Programming Language - RoPL™ - for off-line programming of mechanical robot arms.

RoPL is so easy to use that even novice programmers can quickly master it. Programs are developed off-line and entered using a screen editor with English-like commands.

- **ARSENAL ROBOT.** A robot to remove metallic burrs from inside an eight inch cannon breech ring was designed by Henderson for use at Watervliet Arsenal in Albany, NY.

Conventional robot arms have five axes - swivel base, shoulder, elbow, and two on the wrist. We've added a sixth axis to enable the robot to nearly duplicate the movement of a human arm and wrist. This flexibility was needed to gain access to the intricate twists and turns in the breech ring's interior passages.

- **AUTOMATIC LEAD-WEIGHING SYSTEM.** Lead powders and pastes used in plastics manufacturing must be accurately measured to meet strict OSHA safety standards. Henderson Industries designed a lead-weighing system that automatically feeds a preset quantity of lead into the process using high-accuracy weight measurement. A unique weighing system, which measures weight by subtracting the mass of material removed from a batch sitting on a scale, digitally displays weighing accuracies as close as plus or minus 0.05 percent.

• **RUBBER-COMPOUNDING CONTROL CONSOLES.**

Henderson Industries recently contracted with Ta Chung Hua Rubber Tire Plant to design and manufacture rubber-compounding control consoles and material handling equipment. The equipment will be used to automate the plant's Banbury mixing process in the manufacture of truck, car, and bicycle tires. Henderson Industries is the first black-owned corporation in the United States to do business with the People's Republic of China.

The system you want is the system you get.

We complete our projects on time, on target, and on budget. The secret of our success is working closely with you, our client, every step of the way.

Your project begins when we consult with you to determine your requirements. We use a "structured design" approach to gather and document design requirements. Structured design starts at the top with a broad view of your needs, then branches downward into modules of detail.

This approach lets us cover all the important points without losing sight of the overall goal.

We review every aspect of the problem, including technical specifications, schedules, budgets, operating conditions, procedures . . . even the availability of commercial parts. We take the time to study your needs – and your application – then we can design the most efficient system at the lowest possible cost.

Next, we work with you to turn preliminary ideas into accurate functional specifications. We then prepare sketches, layouts, and diagrams, and plan the various engineering tasks. Proven standard components and sub-systems are incorporated whenever possible to assure reliability and reduce development costs. The end result of our work can be a comprehensive design document. Or, we can continue through to manufacture, deliver, and install the completed system.

A number of formal review sessions are built into the design process to ensure that we understand your requirements every step of the way. We keep you fully informed of the project's status.

And, if new problems arise or the nature of the project changes, we can immediately adjust our design to meet these changes. As a result, you get the design you need – when you need it. With no problems. And no surprises.

RECENT PROJECTS INCLUDE:

- Military, commercial, and overseas contracts
- Computer systems integration
- Control systems
- Communications equipment
- Data acquisition
- Materials handling
- Robotics for manufacturing and material handling
- Microprocessor and programmable controller-based raw material handling, weighing, monitoring, and control systems
- Signal processing
- Data communications
- Doppler VOR ground navigational aid equipment
- HF, VHF, and UHF receivers, transmitters, and related hardware
- Large-scale control panels
- Instrumentation and controls for processes, power plants, radioactive waste disposal, motor control . . . many other applications
- Automatic weighing systems

People, our number-one resource.

When you put us to work for you, you tap into a pool of engineering and technical talent that few other companies our size can offer.

Henderson Industries employs over 35 engineers and technicians specializing in a broad range of disciplines - mechanical engineering, electrical engineering, electronics, computer science, and application development. These knowledgeable, talented engineering professionals can turn your ideas into practical realities.

Our history.

Henderson Industries has over 30 years experience in the designing and producing of engineered systems, products, and components. The company specializes in creating integrated systems whose design requires skill in the areas of computer science, electronics, electrical engineering, and mechanical engineering.

Henderson began as a manufacturer of industrial weighing and material handling systems. Current projects cover a broad spectrum - everything from robots and the space shuttle, to new computer languages and hardware, to military electronics and aircraft navigation systems. Today Henderson Industries employs over 100 people and is one of the largest minority-owned corporations in the United States.

The first step.

If you have an engineering problem that requires a one-of-a-kind solution or engineering service, we can help. We offer a free, no-obligation, on-site consultation in which we take a look at your application, assess your needs, and make recommendations on how we can help solve your problem - quickly, innovatively, and economically.

To find out more about our free on-site consultation, or to receive technical literature on any of the products or systems described in this brochure, call or write us today.

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