



How MATRIC is Kickstarting the Region's Research & Development Activities

Keith A. Pauley, President and Chief Executive Officer
MATRIC

Keith A. Pauley was appointed president and CEO of MATRIC in April 2004. He brought more than 16 years of technical experience in the development of high technology systems for various governmental and commercial customers.

Mr. Pauley has provided management and technical leadership for NASA, the U.S. Department of Energy, and the U.S. Department of Defense, as well as General Motors, Boeing, and Lockheed-Martin. He supported nuclear research for the Pacific Northwest National Laboratory for nine years and managed the \$500 million technology development program for the space shuttle and space station at the Johnson Space Center for seven years.

Pauley holds a BS and an MS in nuclear engineering from Oregon State University.



“For the first time in generations, the nation’s children could face poorer prospects than their parents and grandparents did. We owe our current prosperity, security, and good health to the investment of past generations, and we are obliged to renew those commitments in education, research and innovation policies...”

—*Rising Above the Gathering Storm*,
National Academies Press, 2006.

This assessment of our nation can not be any truer than in the state of West Virginia. For example, of the first 500 commodity chemicals produced, 286 were first discovered and brought to commercial scale production in the Kanawha Valley, which earned hundreds of billions of dollars worldwide. The Union Carbide Corporation alone created over 30,000 patents worth over \$18 billion dollars at the Union Carbide Technology Center, now called the South Charleston Technology Park.

With this heritage behind us, the Mid-Atlantic Technology Research and Innovation Center (MATRIC) is making a down payment on the future prosperity of the children of West Virginia through mentoring and research and innovation from their laboratory facilities at Dow Chemical’s South Charleston Technology Park.

MATRIC has a dual mission that focuses both on business return to assure long-term economic viability and the social concerns of the Mountain State and the nation. These concerns are like the double lens of a pair of binoculars that bring distant objects into clear and precise focus through what we do and how we do it.

Stewards of the Future

MATRIC has offices and laboratories in the South Charleston Technology Park, a location well suited for research and development activities.

In the first three years of MATRIC’s operation, over 50 projects have been completed for 29 different federal and state agencies, commercial companies and private foundations. From 2005 to 2006, MATRIC’s contract revenue increased five fold and in 2007, is projected to double that impressive performance metric.

Furthermore, commercialization of developed intellectual property has allowed MATRIC to create four new companies that will manufacture new polymers, natural gas purification systems, biodiesel fuels, ethanol and other biomass products.

MATRIC’s impact on the future of West Virginia’s economy is three-fold:

- 1) The long-term growth of the core MATRIC research organization which will in itself employ many highly-paid scientists and engineers;

- 2) The active partnering with local industry to revitalize their products and services through effective and efficient research and development, which will create new jobs in growing private sector companies; and
- 3) The goal of creating three to five new companies each year that are associated with MATRIC-developed technologies in order to provide these new products and services to the marketplace.

Following are some examples of MATRIC's wide variety of research topics including biodiesel process development, land restoration, software assurance for spacecraft and mine safety technology.

soy and other oils to produce high quality biodiesel fuels.

As part of the agreement with BEST Energies, LLC, MATRIC has the right to develop up to 20 million gallons per year of production capacity using this novel process design. Currently, several sites are being considered throughout the state and region for the construction of one or more facilities of this type.

Appalachian Land Restoration Center

MATRIC has recently developed an embedded research center that will create science and technology to restore economic value to mine-scarred lands throughout

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Biodiesel

MATRIC has created a partnership with BEST Energies, LLC in Madison, Wisconsin to develop a new and innovative continuous process to manufacture biodiesel transportation fuels. The process has the potential to nearly double the production capacity of traditional batch processes, which are the most common throughout the biodiesel industry.

This new approach was conceived and developed in MATRIC Biomass Chemistry Laboratory which has tested a wide variety of vegetable oil feedstocks and catalysts over the last year. The optimal laboratory process was used to generate a detailed plant scale engineering design by MATRIC, which is now under construction in Cashton, Wisconsin. The 8 million gallon per year Cashton Plant will use

West Virginia. Specifically, the Appalachian Land Restoration Center will conduct research activities on soil, water and plant species to develop valuable agricultural and forestation uses; alternate land uses; and K-12 education in natural resources, biology and overall ecology.

The Center will focus on science and technology and will present data, information and new technology so that landowners, mining companies, state and federal regulators, as well as state and federal policymakers can extract the maximum value for their land use in the overall recovery of mined lands.

With over 190,000 acres of surface-mined lands in the state, the important mission of the Center will be to give landowners the

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technical tools to create long-term economic value from post-mine lands.

The Center will be co-managed by MATRIC, West Virginia Land and Mineral Owners Council and West Virginia State University, and will include partnerships with West Virginia University,

Marshall University and other entities across the state. Open scientific-oriented access to the resources of the Appalachian Land Restoration Center will be guaranteed to all non-profit and university partners committed to advancing the technical mission of the Center.

Software Assurance

MATRIC has teamed with the L-3/Titan Corporation to support NASA in the analysis of software for the New Horizons Pluto-Kuiper Belt Mission, a mission designed to explore the mysterious worlds at the edge of our solar system.

The New Horizons spacecraft has been outfitted with a complete suite of instruments to perform scientific measurements of Pluto and its moon, Charon. As part of an extended mission, New Horizons will continue its journey into the Kuiper Belt region of our solar system in hopes of encountering trans-Neptunian objects, or minor planets.

MATRIC has provided software assurance for the fault protection autonomy system onboard the spacecraft. The autonomy system is responsible for detecting and correcting any problems with the spacecraft and its subsystems that could jeopardize the mission.

The New Horizons spacecraft was launched from Cape Canaveral, Florida in January 2006, and will take advantage of planetary positioning by using Jupiter to “slingshot” it towards Pluto. New Horizons will reach Jupiter approximately 13 months after launch, and will fly three to four times closer to the gas giant than the Cassini spacecraft.

During the brief encounter with Jupiter, New Horizons’ arsenal of scientific instruments will be exercised and tested, obtaining extraordinary scientific data on the biggest planet in our solar system. After the Jupiter fly-by, New Horizons will enter “hibernation” mode and prepare

itself for the long journey to Pluto. It is scheduled to make its first contact with Pluto in the year 2015.

MATRIC is part of the team led by Titan Corporation to perform as much as \$200 million in research services over five years across every mission within NASA, including the International Space Station, Space Shuttle and interplanetary spacecraft.

Coal Mine Safety

MATRIC is investigating a new technology concept for providing breathable air to miners who may be trapped for extended periods after a mine accident

In emergency situations resulting from fire within a mine, oxygen in the air is consumed to feed the fire. In some cases, the oxygen remaining in the air drops to levels too low to sustain life. In addition, toxic carbon monoxide may be generated by the fire.

Currently, in these situations, miners rely on a closed breathing system that generates a one-hour supply of oxygen. Since it may take many hours for a successful rescue attempt, it is necessary to store a considerable number of these devices at locations in the mine to ensure a continuing supply of breathable air.

The concept being investigated by MATRIC follows a different approach that does not rely on consumable oxygen supplies. Instead, this technology uses the low levels of oxygen remaining in the depleted air and selectively enriches the oxygen until it reaches a breathable concentration.

At the same time, undesirable gases such as carbon monoxide would be separated or destroyed. New catalytic systems for CO destruction are the focus of a separate investigation, and they could be incorporated into the device.

MATRIC’s approach to oxygen enrichment uses novel separation techniques that have

been demonstrated in home use applications for medical patients with lung disorders. The low power requirements could be supplied by batteries or by a mechanical source.

“The goal of this work is to develop a user-friendly and economical solution,” says Dr. George Keller, who is leading this effort. “It is clear that this technology can produce breathable air and could save lives when other supplies would have been exhausted.”

Doing It Right

MATRIC is just as committed to doing research and development in the right way as we are to developing the right science and technology. The MATRIC values are the articulation of our approach.

We cherish fast-paced market-oriented innovation.

We are the best-in-class innovators because we value intense customer focus.

People are our most treasured asset.

We conduct all our business with the highest standards of ethics.

We value diversity of thought, experiences, disciplines, and cultures.

MATRIC is a fun and exciting place to work.

MATRIC is committed to our dual mission, which focuses both on the financial performance of the corporation as well as the social concerns of West Virginia and the United States. As we continue to grow, we will be even more effective in meeting these important obligations to the next generation of citizens. √