

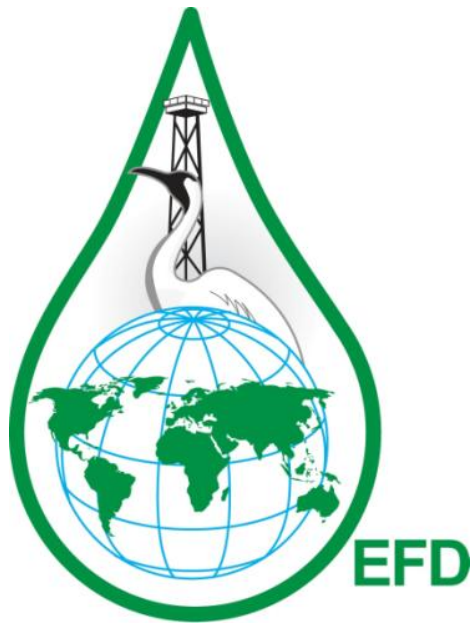
Technology Integration on the Eagle Ford



As Part of the Environmentally Friendly Drilling (EFD) Program, the Texas Center for Applied Technology (TCAT), a research center of the Texas A&M Engineering Experiment Station, has partnered with the Houston Advanced Research Center (HARC) and the Global Petroleum Research Institute (GPRI), to demonstrate a new method for proper measurement and verification of emissions from natural gas drilling operations in the Eagle Ford Shale Play. This research includes determination of mobile and stationary sources, emission measurement through new technology and integration of emission reducing, cost saving technologies as best management practices.

METHODOLOGY OVERVIEW

To ensure a full emissions footprint from a shale gas operation, TCAT, HARC and GPRI will first evaluate all equipment and fuel use at each stage of gas drilling and production. TCAT, HARC and GPRI will then use data gathered to outline potential sources of NO_x and VOCs that typically occur from a drilling operation. Best practices currently in use by the operator will be noted and new technology for best practices such as methane capture and resell, microgrids and electric motors will be evaluated on site. TCAT, HARC and GPRI have employed petroleum engineering students who will assist throughout the research. This not only makes the project more cost effective, it also provides valuable hands-on field experience for the Petroleum Engineering students at Texas A&M.



DEMONSTRATION

Once emission sources are calculated, TCAT will work with Eagle Ford Natural Gas operators and service providers, to install and demonstrate emission reduction technology to include

- Power ancillary support such as kitchens and trailers with TCAT microgrid technology (see TCAT Microgrid project)
- Use of low emission fuels or electric motors where applicable
- Use of Vapor Recovery Units (VRUs) for recover to reuse/resell
- Use of enhanced leak detection and repair technologies
- Use of Green Completions process (collect and filter gas/liquids back to the surface to reuse in production lines)



TEXAS CENTER FOR APPLIED TECHNOLOGY

There are many problems that require the careful and proper integration of applied technologies to find solutions. The Texas Center for Applied Technology (TCAT) was created to focus on these specific problems and to develop effective and efficient solutions. TCAT's core competency is the innovative application of existing technologies and advanced research to solve complex real-world problems.

TCAT's primary objective is to apply and test technologies to address targeted problems and engage basic research as required. TCAT has employees in a variety of locations with the ability to perform research that cuts across multiple technologies, disciplines, and cultures. The Center's employees are knowledgeable regarding customers' requirements and are ready to respond effectively to provide the best value for the customers' needs including expertise in technology insertion, technology assessments, and test and evaluation.

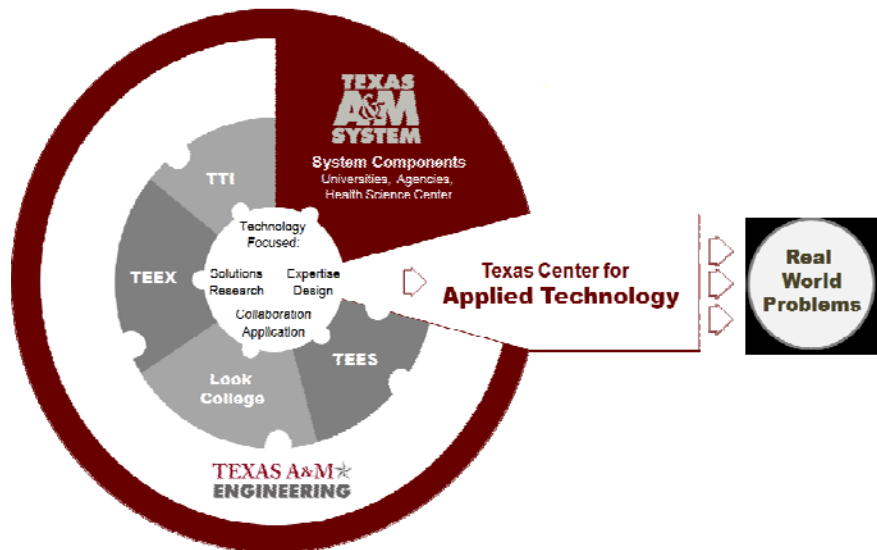
TCAT is part of the Texas A&M Engineering Experiment Station (TEES), a member of The Texas A&M University System. The A&M System is one of the largest and most comprehensive systems of higher education in the United States. Through a statewide network of eleven university campuses, seven state agencies, and a comprehensive health science center, the A&M System educates more than 120,000 students on its university campuses, conducts more than \$780 million in research, and reaches another 22 million people through service each year. TEES is an engineering research agency for the state of Texas and conducts over \$147 million in research annually. Because of the Center's position within the Texas A&M Engineering program, TCAT's expertise can easily be extended by rounding out its team with world class faculty researchers, as appropriate. TCAT is in an excellent position for collaboration not only with The Texas A&M University System components and their customers but with other universities, institutions, centers, and industry.

TCAT'S CORE COMPETENCIES

Energy Sustainability ★ Environmental Sustainability
Manufacturing & Systems Engineering ★ Information Technology ★ Modeling & Simulation
Technology Insertion ★ Test & Evaluation

TEXAS A&M ENGINEERING

Texas A&M Engineering consists of the Dwight Look College of Engineering, and three engineering agencies, including TEES: Texas A&M Transportation Institute (TTI) conducts research and professional education in all modes of transportation. The Texas A&M Engineering Extension Service (TEEX) works to develop a highly skilled and educated workforce and enhances public safety through training, continuing education, and technical assistance.



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