
Advanced In-Situ Process Analyzers Commercialized

Project Title: Development of In Situ Analysis for the Chemical Industry

Project Goal: This project is developing two platforms for robust, in or at line, process measurements that operate at or near real time. The two process analytical platforms targetted are:

- (1) Laser Based Sensors
- (2) Solid State Sensors.

These systems will be capable of **operating at the required process conditions (pressure, temperature, etc.), providing real time or near real time data, and significantly reducing the installation and operational cost** when compared to the current market available products.

The need for these platforms and the measurements they will provide are driven by advances in process control (APC) systems and the need to “close the loop” in modern control systems. With few exceptions, current process analytical (PA) techniques are lacking in the speed of measurement, accuracy of measurement, sensitivity of measurement and the overall cost of providing the measurement.

Project Team: A unique project team was compiled for this project:

Department of Energy	<i>DOE assistance was needed as a mechanism to fund the development of these technology areas.</i> <i>While larger companies such as Dow have significant resources and expertise that can be applied towards these efforts, it is difficult to justify significant investments in technologies that will see energy savings and economic benefits across the entire industry (including Dow competitors).</i> <i>This effort is an example of a breakthrough that will enable improved process control and the resulting energy and economic benefits being applied industry wide.</i>
Dow Chemical (www.dow.com)	As one of the largest chemical companies in the world, Dow operates numerous energy intensive processes. Dow applied their extensive expertise in process operation and optimization, analytical technologies knowledge and project management.
Analytical Specialties (www.analyzer.com)	As a supplier of analytical instruments, ASI lead the product design and development effort. ASI is also the commercial partner in this effort, currently marketing the TruePeak Tunable Diode Laser analyzer (directly resulting from this project) and will market future measurement platforms resulting from this program.
Synkera (www.synkera.com)	Synkera develops and manufactures products utilizing nanotechnology, microfabrication and advanced materials engineering. Synkera lead the sensor design and fabrication effort.
Rice University Laser Science Group (http://www.ece.rice.edu/lasersci)	As one of the leading research groups in the laser spectroscopy field, the Rice Laser Science group has lead the research and investigation into laser sensors for this effort.

Commercially Available Product

As a result of this program the first commercially available product has been released to the market, within 6 months of project completion two additional products are expected to see market release.

The first product to market is the ASI TruePeak Tunable Diode Laser analyzer. This product has applications into most major chemical and refining processes, specific measurements with energy savings benefits are:

Combustion Oxygen Analysis.	Process heaters, furnaces, incineration.
Process Optimization.	Reactor oxygen control
Safety Oxygen Analysis.	Reducing measurement error and reducing plant trips due to incorrect oxygen measurement



TRUEPEAK TUNABLE DIODE LASER ANALYZER



- In Situ Analysis
- Fast Response (1-20 seconds)
- Interference Free for most applications
- Capable of Measurements with changing pressure/temperature/background gas
- TruePeak Measurement
- Process Pressures up to 20 Bar
- Process Temperature up to 1500C
- Aggressive Options – high particulate, corrosives, more
- Optical Measurement, no sensor contact with process
- Low LTCO (no moving parts, high MTBF for components)
- Flexible Installation Options
- On Board Diagnostics
- Field Repairable

The first tunable diode laser analyzer designed **specifically** for process analysis

Typical Application

Optimization of an ethylene cracker is one of the targets. Significant advantages can be realized through advanced analysis and control.

Targets for this project are:

- Cracked gas analysis is typically performed by gas chromatographs with long measurement times and high cost of ownership. Application of a near real time measurement can allow for improved cracking control.
- De-coke analysis can indicate the efficiency and endpoint of the de-coke cycle.

Many other applications in other processes are possible with these technologies.

SUMMARY INFORMATION	
Goal	Achieved
<i>13.37 tBTU Industry Energy Savings</i>	40.59 tBTU (future estimate of program results)
<i>3 Sensor Platforms</i>	2 Field Tested, 1 In Progress 1 Commercially Available orders placed
<i>Providing real time or near real time data</i>	Platforms tested provide measurements in 2-7 seconds
<i>Significantly reducing the installation and operational cost</i>	Cost comparisons for orders placed show 40-60% reduction in measurement cost
<i>Operating at the required process conditions (pressure, temperature, etc.),</i>	Measurements successful: <ul style="list-style-type: none"> - Long path of 60ft - High temperature 1200C - High particulate - Corrosive - Lethal Service - Pressure 5barA (20barA design)
<i>Installation at Process</i>	Field and environmental testing -5to55C Haz. Area approvals pending
<i>Measurements in Major Chemical Processes</i>	2- Olefins measurements 3- Chlorine measurements 1- Incineration measurement 2- Combustion measurements 1- VCM measurement
<i>Enable Advanced Process Control</i>	APC being developed based on field test data
<i>Field Testing of Platforms</i>	5 Field Tests Complete or In Progress