

**SRD Exhibits ONR Funded Chemical Detector Technology &
Supporting Gas Delivery Systems (GDS) at PITTCON 2005**

Final Report

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Introduction

SRD attended PITTCON 2005 in Orlando, Florida with an exhibitor booth to showcase their chemical detector technology being developed for The Office of Naval Research as well as gas delivery systems (GDS) that are a spin off technology of the chemical detector development efforts. The preparation for this event included designing poster boards for the chemical detector work funded by ONR and gas delivery products, coordinating logistics and searching for supporting technologies to enhance SRD's chemical detector and GDS development efforts. This report presents the highlighted efforts involved for SRD to attend PITTCON 2005 as an exhibitor and the benefits of the conference to the ONR chemical detector development efforts.

Why did SRD Develop a GDS Product?

As a result of SRD's chemical detector development efforts and requirements to challenge their sensors to CWAs and TICs in the presence of interferents, as required by the ONR contract, SRD became very knowledgeable and proficient in gas delivery systems. SRD needed a gas delivery system that would be capable of creating accurate, complex gas mixtures to simulate the various environments in which their sensors would eventually operate. The system typically would need to incorporate the three main gas sources including compressed bottles, permeation ovens, and bubblers. SRD's in-house gas delivery systems have been evolving since the company's inception over 12 years ago to push the envelope of gas sensor testing and evaluation. These advancements provide a highly proven and versatile GDS system for gas sensor development, process control applications, etc, and ensure that the ONR funded CWA detector development effort delivers the required performance.

Logistics for SRD to Participate in PITTCON 2005

In order to participate as an exhibitor at PITTCON 2005, SRD had to coordinate many logistics, both technical and administrative. SRD designed a booth layout and selected a booth vendor. A streaming video was developed that showcased ONR's chemical detector project and SRD's GDS products as they pertain to chemical detection. The video was developed in-house with the focus on explaining the importance of gas delivery systems, and the impact upon the delivery of the eventual ONR prototype detector. SRD fabricated a selection of SMO and P-SAW chemical sensors and a GDS for demonstration. SRD sent four technical personnel to PITTCON 2005, two for booth duty and two to conference sessions to attend presentations and poster sessions on sensor technology that might complement the ONR project.

Poster Boards & Product Brochure

SRD developed poster boards for the chemical detector effort currently funded by ONR and for their GDS products. The chemical detector poster board is shown in

Figure 1. The poster depicts an artist rendering of the final handheld chemical detector that SRD is developing for ONR along with a supporting gas delivery system (GDS). The GDS is used to challenge SRD's SMO and P-SAW sensors to chemical warfare and toxic industrial chemicals in the background of interferents, such as battlefield conditions as required by the ONR project.

GDS Series Applications
The Solution To Your Gas Delivery Needs

why?

- No commercial gas delivery system could meet our needs.
- The GDS Series technology was developed to be accurate, reproducible, and reliable.

what does it do?

- Generate complex gas mixtures to precisely simulate chemical environments.
- Use the GDS to challenge the detectors in the battlefield.

Desired Chemicals

Battlefield Environment

supported by

under contract

The Development and Prototyping of a Chemical Warfare Agent Detector Using Solid State Sensor Technology

Sensor Research and Development Corporation

Figure 1. Poster board for SRD's Chemical Detector Program funded by ONR and Gas Delivery Applications.

Components of the GDS

The most prominent feature of the GDS is the ability of the system to stage (or premix) its gas mixtures before they are sent to the output of the system. This function is critical to the challenge and verification of sensor performance required in the ONR detector project. Below is a flow diagram of the system (Figure 2: Flow Diagram) showing a gas mixture being staged.

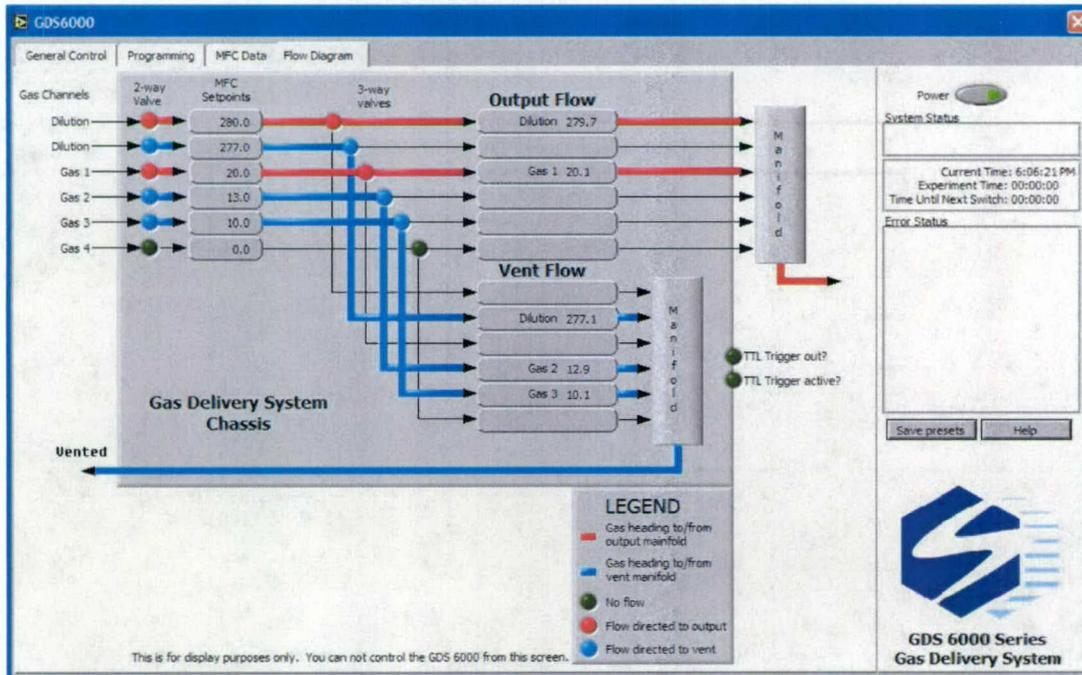


Figure 2: Flow Diagram

This diagram is a visual description of how the gases are flowing within the GDS 6000 (6 channel gas delivery system) chassis. Gas bottles are connected to the system on the left and directed through 2-way shutoff valves and Mass Flow controllers. The gas channels that are highlighted in red represent channels that are flowing gas to the output of the gas delivery system. The output manifold is where these gas channels are mixed together and directed to the sensor chamber to be detected and classified. The gas channels that are highlighted in blue represent channels that are flowing gas to the vent port. The vent port is used to allow the gas channel to stabilize its flow rate before it is sent to the sensors. Once these channels have stabilized their flow rates, the direction of flow for all of the gasses will be switched so that the gasses currently sent to the vent will be sent to the output. This process is referred to as staging and is used so that when the gases are sent to the output the flow rate is consistent throughout the exposure.

This is especially important when bubblers and permeation tubes are used. For these gas sources, the flow rates need to be consistent for an extended period of time before the concentration of the gas at the output of the device is consistent. This is relevant for our application because our sensor arrays are measuring the gas stream flowing from the output of the gas delivery system in real time. In order to do this consistently and accurately, staging needs to be used.

Another advantage is ease of use and programmability. The GDS is able to load/create/save its gas sequence files as tab-delimited text. This allows the user to program a sequence at their desk, using a standard spreadsheet program, and then downloading that file onto the computer that is controlling the gas delivery system. Data files can be created when these gas sequences are being executed that will save the flow rates and flow directions for each gas channel. The system has the ability to alert the user to potential problems in the system to insure that the gas being delivered is consistent and accurate with what the user wants.

The graphical interface created for the system provides a familiar Windows® “Point and Click” environment. The control screens are displayed below (Figure 3: Graphical User Interface.)



Figure 3: Graphical User Interface

While at PITTCON 2005, SRD provided a demonstration of how the gas delivery system was used in sensor testing, particularly the testing performed on behalf of ONR. A significant amount of interest was generated on how this technology could be applied to several other gas delivery applications.

What SRD found at PITTCON 2005 that advances the ONR Chemical Detector Development Efforts

SRD attended a number of presentations and poster sessions, and visited many exhibition booths. Although there were other companies working on chemical detectors, there technologies were not nearly as sensitive and small as SRD's SMO and P-SAW sensors. However, some companies had done some significant "box" packaging that may be of use to SRD as it approaches the development of a prototype detector. SRD also found chemical companies that can provide the starting materials for sensing film synthesis. Companies that sell analytical equipment, such as interferometers, gel permeation chromatography, x-ray photoelectron spectroscopy systems, lasers, gas delivery parts (i.e. mass flow controller, connectors, tubing, valves, etc.). SRD also met with companies that can provide gas supply equipment (i.e. compressed bottles, permeation devices and ovens, bubblers) to better support the demanding gas sensor testing required for developing a CWA and TIC detector. SRD is already planning to attend and exhibit the PITTCON 2006 with the expectation that a fully functional ONR developed chemical detector will be demonstrated.

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