Scientific Services Program
Capabilities Statement

Excet, Inc. is a small scientific and engineering business focused on providing technological support services to government and commercial clients. The company's senior management is comprised of scientists and engineers holding advanced or terminal degrees. All have grown from bench level researchers to broad-based program managers in U.S. Government research laboratories and engineering support facilities over careers spanning decades. Excet excels at finding the right people for any research, engineering, or project management challenge. We offer an employee benefits package and overall cost structure that attracts and retains the highest quality of employee while maintaining a competitive cost structure for our clients. Currently, we provide scientific and engineering support to the Edgewood Chemical Biological Center (ECBC), the Naval Research Laboratory (NRL), the Naval Sea Systems Command (NAVSEA), the Naval Surface Warfare Center (NSWC), the Army Center for Environmental Health Research (CEHR), the National Institute of Standards and Technology (NIST), the Marine Corps Systems Command (MCSC), and other federal agencies and commercial entities.

CBRNE Defense Expertise

Excet has been supporting CBRNE agencies since its founding in 2005, and is one of the few companies that have both chemical and biological agent surety/PRP programs. The founder and President, Mr. Richard Matuszko, has been working in the CBRNE defense field for over 32 years, and brings a wealth of experience and expertise to the company. Excet currently has three contracts with ECBC, including a prime award on the small business task order contract. We maintain expertise in CB agent chemistry/properties, with specific expertise in, biological detection, genomics, bioinformatics, decontamination, analytical chemistry, stand-off detection, smokes/obscurants, and aerosol science.
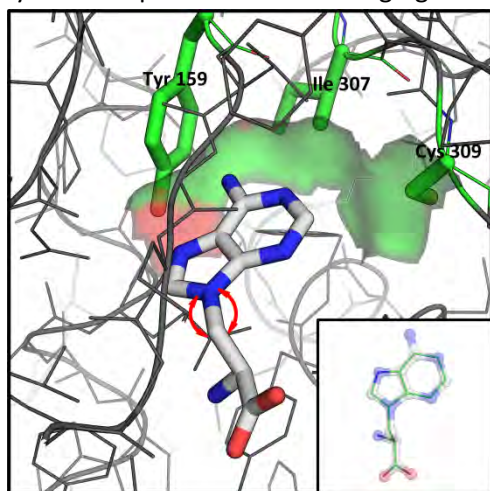
Chemical & Biological Sampling, Detection, & Identification

Excet has expertise and many years to experience in the specialized discipline of detection and identification of chemical and biological (CB) warfare agents. Our scientists and engineers have developed the basic science, applied science, and research to support the development and acquisition of new, state-of-the-art CB detection and identification materiel. We have focused on improving time to detect and identify various CB weapons/threat agents. Additionally, our scientists have developed technological improvements to lower the limits of detection while decreasing the various technologies false positives and false negatives. Excet engineers have advanced the combined use of mobile ground sensors, discreet sample collection, and analysis technologies to address the technical and operational capability gaps with respect to search, detection, and identification of CB threats. Our subject matter experts (SMEs) are well versed in sensory sciences, and have extensive knowledge in operational mission needs of the Warfighter.

Our research and development efforts have addressed the associated challenges for the specific areas of search, detection, and identification technologies for chemical and biological threats when complicated by obscurants/interferents expected in the operational environment. Additionally, our SMEs have developed operational source term data, tactics, techniques, and procedures to optimize the successful application of the various chemical and biological sampling and detection technologies. Our scientists and engineers have analyzed operational units utilizing prototype technologies for systems and performance metrics. Our data analysis of these prototype materiel solutions provides the identification of vulnerabilities and mission critical technical requirements and performance specifications.

Excet scientists offer critical expertise in biological agent recognition elements, from traditional hybridoma production to emerging combinatorial ligand technologies. In addition to development of novel affinity reagents, we have a depth of experience in current gene synthesis, high-throughput cloning, expression optimization, production, validation, and QA/QC of biomolecules, including antigens, antibodies, and engineered or synthetic proteins. Our scientists also actively conduct research on novel small molecule inhibitors of bacterial pathogenesis with application as potential therapeutics. They coordinate wide-ranging research work on biological toxin characterization and have recently developed a novel detection assay for discriminating active ricin toxin activity using fielded fluorescent detection platforms (shown left; provisional patent submitted in 2010).
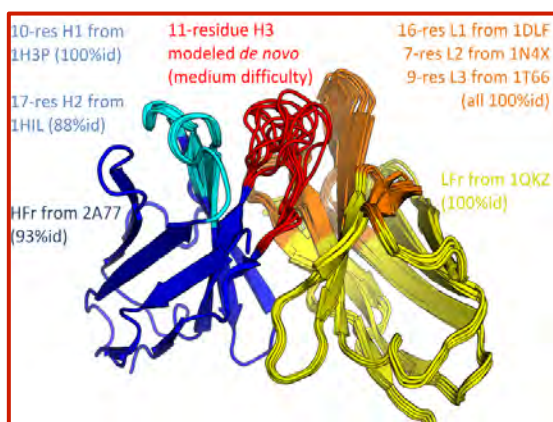
CBRNE Capabilities and Experience

Excet employees serve as subject matter experts in biological detection, directly supporting the Critical Reagents Program, and offer extensive technical laboratory skills critical for basic and applied research and engineering development endeavors.

Excet has provided test-bed support for mobile ground sensor exercises and have developed training aids for sensor calibration. Additionally, we have developed low-visibility chemical and biological sample collection and analysis techniques. We have conducted developmental and operational validation experiments and exercises of current and emerging technologies for sampling collection, sample analysis, chemical and biological search, detection, and identification.

Excet has extensive expertise in the generation and analysis of fundamental chemical and biological aerosol data i.e., source term data. Our scientist have investigated Infrared signature as a function of aerosol composition and size to determine detection and identification characteristics. Additionally, we have conducted research in to the elucidation of reaction mechanisms, such as, reactants, products, and kinetics. Our researchers have developed and analyzed transport data with respect to adsorption, uptake, and re-suspension.

Genomics & Bioinformatics

Excet scientists offer experience and guidance with bacterial pathogen genome sequencing and characterization. Our capabilities and experience expand beyond shotgun sequencing to include sequence finishing and transcriptomics, with a fully dedicated bioinformatics pipeline. In addition to bioinformatic analyses of genomic data generated at ECBC, we provide assistance in taking a DNA sample to a fully sequenced and finished genome and have experience applying advanced structural and bioinformatic/statistical techniques to library design and computationally-directed protein engineering.

Analytical Chemistry

Excet's specialists provide analytical capabilities with superlative quality and efficiency, and cover the full complement of traditional techniques, such as LC-MS, GC-MS, NMR and other spectroscopic methods, and beyond. They excel at method development, tailoring each testing procedure to each application to best answer the specific scientific question at hand. Moreover, our ability to integrate with government facilities and general work ethic results in exceptional productivity on a per worker basis. For these reasons, Excet scientists are frequently called upon to train their non-Excet colleagues.

Additionally, Excet is the provider of Direct Analysis in Real Time (DART) expertise to ECBC. DART is a novel ion source able to ionize compounds from surfaces, without contact, in open air in a few seconds. It permits highly sensitive mass spectral detection and identification of most compounds with little or no sample preparation. It is particularly sensitive to chemical weapons and explosives. Our scientists not only optimize and prove-out this promising technology, but advance it as well, generating several enhancements, each in the patent process. Their work has produced numerous peer-reviewed journal articles, oral presentations and a book chapter in *Forensic Analysis on the Cutting Edge: New Methods for Trace Evidence Analysis*.

Aerosol Science

Excet heavily supports ECBC Aerosol Sciences Branch (ASB), providing expertise in both biological and chemical aerosol behavior. Our scientists, in conjunction with ASB, develop novel instrumentation to characterize aerosol physical and chemical properties. Additionally, we support the development of technologies to reliably generate well characterized aerosols. This and other detector work, in turn supports aerosol detector development.
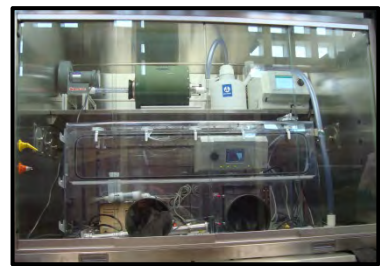
Stand-off Detection

Excet provides technical support to ECBC's Laser Standoff Detection programs. We test and collaborate in designing active standoff detection systems with particular emphasis on Infrared/Raman detection techniques. Raman spectroscopy is a backscatter phenomenon which provides unique and identifiable 'fingerprints' of chemical compounds, allowing warfighters to determine identities of chemical, biological, and explosive threats reliably at safe distances with no sample preparation or destruction. Excet is involved not only in the evaluation of detection systems but also research at the forefront of new laser detection methods.

Smoke & Obscuration Science

Excet provides a scientifically integrated approach to increase the understanding of aerosol obscuration generation, aerosol obscuration collection, aerosol obscuration concentration, obscuration formation, and aerosol obscuration physical and electromagnetic properties. The integration is accomplished by employing *ab inito* modeling and high fidelity particle examination and analysis. We provide concept development, chamber test & evaluation, field test & evaluation, data collection, data analysis, and experimental research. Excet addresses research in applied physics for the development of next-generation obscurant systems and novel concepts utilizing obscurant technology. Our experience is broad in scope with disciplines in atmospheric chemistry, electromagnetic extinction, sensor modeling,

materials science, dispersion technology, signal processing, instrumentation, experimental development, and fieldwork.
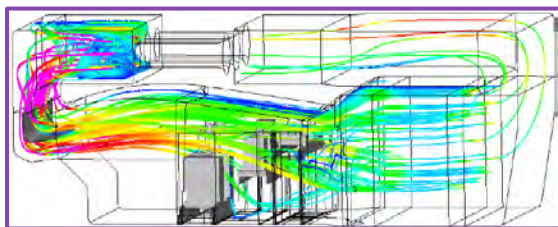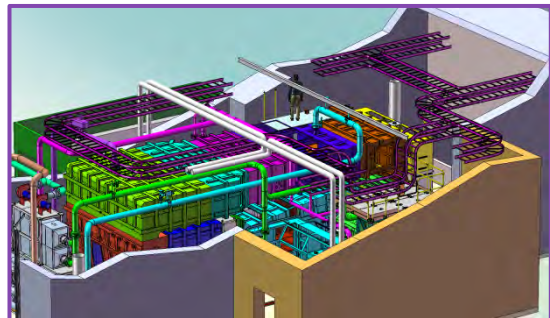
Excet conducts research and development efforts to create new smokes and obscurants. Novel aerosol analytical techniques for the identification of obscurant materials are being developed, revised, and enhanced to meet the evolving smoke and obscurant scenarios. Some of the obscurant materials that

Excet is developing are a mixture of solid particulates or a composite coating on particulate materials. Our expertise is critical to developing formulations specific to each aerosol generation technique and final aerosol characteristics. Excet conducts research and development efforts for new and novel methods for the generation and quantification of critical aerosol parameters, such as, particle size and associated distribution, number density, electromagnetic properties (real and imaginary), and particle component concentration, under various well controlled environmental conditions (wind speed, humidity, and temperature).

Engineering Development Support

Excet has experience and expertise in providing engineering support, and recently developed the overall and subsystems design for the Whole System Live Agent Test (WSLAT) project to test new biological detectors with aerosolized live biological agent. Our responsibilities included the development of the aerosol generation system, aerosol formulation testing and analysis, aerosol collection and detection systems, aerosol removal system, aerosol conditioning system, facility HEPA filtration system, biological stimulants development, and Computational Fluid Dynamics (CFD) modeling analysis for the design of the aerosol circulation chamber. This multi-year program required extensive coordinating of scientific and engineering resource to achieve a successful fabrication and implementation of the WSLAT project.

Material Test Support

Excet uses analytical systems for the detection of permeation of chemical agents and certain toxic industrial chemicals, providing a basis for establishing the chemical resistance of selected materials. A number of these materials are expected to result in off-gassing or a process of neutralization caused by the breakdown of agents into various byproducts. The analysis of these off-gassing and reaction byproducts is essential for properly quantifying the permeation resistance of materials that are tested. Excet adheres to established protocols for the separation and identification of permeating chemicals
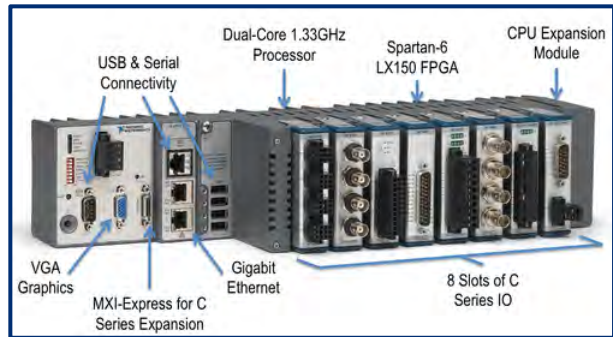
using available techniques based on gas chromatography/mass spectroscopy (GC/MS), gas chromatography coupled with either flame ionization detection (FID) or flame photometric detection (FPD), and liquid chromatography with mass spectrometry. We have developed specific techniques to capture unique off-gassing chemicals or byproducts, utilizing gas bubbles, solid sorbents, and other collection media. Also, we have enhanced/developed analytical techniques for the separation, identification, and quantification of different chemical constituents found in permeating chemical mixtures. Excet has optimized existing techniques through the selection of appropriate sorbent media, the application of collection conditions, and experiments to define mixture separation through gas or liquid chromatography operating parameters.

Environmental Control Development

Excet has been using Programmable Logic Controllers (PLC) systems to control instrumentation and collect data in industrial hazardous and chemical warfare environments since 2005. We have developed and used these systems to control, monitor, and collect data for chemical warfare agent mask tests, chemical improvised explosive tests, and for area displacement confinement devices. We use PAC Project or LabVIEW software to create programs for industrial automation, remote monitoring, and data acquisition. The programs were developed using basic flowcharting techniques and some simple scripting. Excet has experience designing test environments for chemical and biological studies across
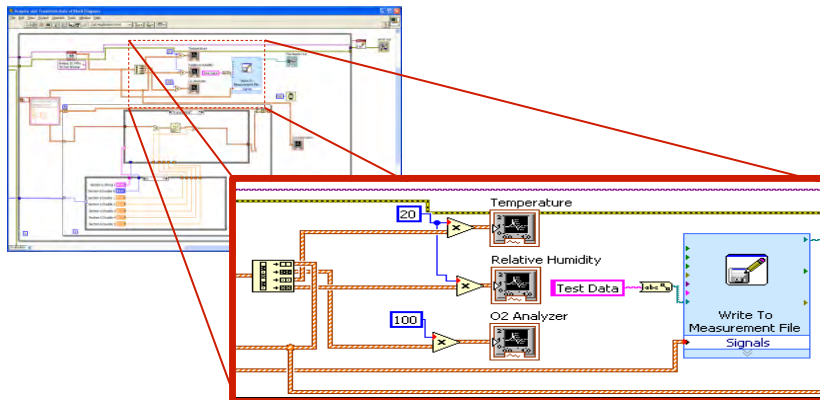
multiple disciplines. Design considerations included environment controls consisting of airflow, temperature, humidity, and pressure. Devices to collect concentration data have consisted of bubblers, cascade impactors, particle counters, video monitoring, or other technologies depending on the

requirements of the tests. The system was designed for longevity, but allows for ease of replacement of failed or degraded components. Excet has developed SOPs to document calibration, runtime procedures, detailing the establishment of a baseline between tests, and the proper procedures for reinitializing the system. We have developed programs for calibration, data collection, and automation

with documented comment blocks or lines explaining different parts of the program and the logic behind the code. Lastly, we developed user manuals to assist engineers and technicians with the operation of the system and all programs.

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