Pacific Northwest NATIONAL LABORATORY

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Battelle Number(s):

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Patent(s) Issued

Available for licensing in all fields

U.S. DEPARTMENT OF ENERGY

Available Technologies

Container Screening Device (CSD)

SUMMARY

The Container Screening Device (CSD) is a portable, bench-top, measurement system for real-time, sealed-container inspection and content (liquid/material) classification and discrimination. This technology uses sound waves to acoustically detect, classify, and discriminate threat versus non-threat substances and materials, such as liquid explosives, hazardous and flammable liquids, and other caustic or dangerous liquids at security checkpoints. The CSD was originally designed as a prototype for both field measurements and bench-top applications for liquid forensics, intelligence and law enforcement scenarios.

The CSD is an advanced tool for checking for materials that can be used to build weapons of mass destruction, concealed contraband and illegal substances, and identifying fraudulently labeled containers. It can also be employed in manufacturing environments to ensure the correct labeling of products and to detect foreign objects, or even by first responders to emergency situations for noninvasive and nondestructive detection of dangerous substances. Other technologies—such as X-ray— often require highly trained personnel and safety measures to be put in place, are quite expensive, bulky, or inadequate for effective classification or identification of liquid contents, and impractical for immediate response scenarios. This versatile tool can rapidly screen bulk containers ranging in size from a 5-gallon container to test tube sized containers in the field. In addition, this technology could easily modified to accommodate the inspection and examination of larger containers (e.g., 55-gallon drums). The CSD significantly reduces the amount of time required to screen such containers at checkpoints, while at the same time increasing the reliability and accuracy of the screenings.

The CSD classification and identification capabilities are based upon comparing a suite of measured acoustic properties (or signatures) of a liquid against pre-characterized, temperature compensated profiles in the acoustic properties database on board the device. Additional capabilities include an automated container distance and temperature measurement, and automated gain function. Current efforts are underway to design and test automatic accommodation for wall-thickness and wall material of the container being tested. Also, the signal processing and computational algorithms employed by the CSD are being modified to more effectively correct for acoustic reflection and transmission coefficients in various wall-materials, which has will significantly improve the consistency and accuracy of information gathered during screening and will provide for a much wider capability for discriminating liquids than other available technologies. This platform is currently capable of acquiring additional acoustic property “signatures” such as acoustic impedance, density, acoustic resonance features, acoustic absorption spectra, and more. Finally, non-acoustic physical sensors may be deployed to obtain additional [orthogonal] data to further increase accuracy and sensitivity.

ADVANTAGES

The CSD employs advanced acoustic signal processing methods to consistently and accurately measure the temperature corrected acoustic velocity (speed of sound) and relative acoustic attenuation in a fluid or material to: * Detect anomalies, contraband and hidden compartments in liquid-filled containers and solid form commodities;

* Sort/Classify liquid types into groups of like and unlike;

* Discriminate threat liquids and bulk-solids from non-threat materials as a function of temperature, and;

* Determine the fill-level in liquid-filled containers.

STATE OF DEVELOPMENT & AVAILABILITY

The basic prototype technology has been developed and tested in lab-scale settings. A working prototype exists, and this prototype requires some modifications to be readied for technology transfer and commercialization to a licensee/manufacturing partner (e.g., additional measurement signatures, product design and form for application would still need to be developed.) Also, the material characterization database currently contains approximately 200 different materials, however this could be supplemented by including additional liquids, (e.g., liquids laced with contraband, other liquid explosives and solvents, etc.).

Patents & Intellectual Property

» Patent #: 7,246,522

Technology Portfolio(s)

» Electronics

» Ultrasonics

» Chemical Sensors

Potential Industry Applications

» Aerospace & Defense

» Agriculture & Mining

» Automotive & Transportation

» Chemicals

» Consumer Products

» Energy & Utilities

» Food, Beverage & Tobacco

» Healthcare, Pharma, Biotech & Medical

» Manufacturing & Warehousing

» Oil & Gas

» Professional Services

» Public Administration & Government

» Recycling & Waste Management

» Security

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Dave L. Greenslade
Pacific Northwest National Laboratory
(509) 375-6555
david.greenslade@pnnl.gov
http://availabletechnologies.pnnl.gov

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