Forensic Technology Center of Excellence

Mobile Evidential Breath Alcohol Instruments

Landscape Study

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Information provided herein is intended to be objective and is based on data collected during primary and secondary research efforts available at the time this report was written. Any perceived value judgments may be based on the merits of instrument features and developer services as they apply to and benefit the law enforcement and forensic communities. The information provided herein is intended to provide a snapshot of current mobile evidential breath alcohol instrument developers and a high-level summary of available instruments; it is not intended as an exhaustive product summary. Features or capabilities of additional instruments or developers identified outside of this landscape may be compared with these instrument features and service offerings to aid in the information-gathering or decision-making processes. Experts, stakeholders, technology developers, and practitioners offered insight related to the use of mobile evidential instruments for law enforcement agencies.

The information shared in this report represents the opinions of the individual practitioners and researchers who participated in this FTCoE project and not the opinions of their agencies or the National Institute of Justice. Mention of specific products in this report does not constitute endorsement by any of the contributors, including NIJ or the FTCoE. For more information or questions about this report, visit www.forensiccoe.org, or contact Jeri Ropero-Miller at jerimiller@rti.org or 919-485-5685.

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The Forensic Technology Center of Excellence (FTCoE)

The FTCoE is a collaboration of RTI International and the following academic institutions, which are accredited by the Forensic Science Education Programs Accreditation Commission (FEPAC): Duquesne University, Virginia Commonwealth University, and the University of North Texas Health Science Center. In addition to supporting NIJ's research and development (R&D) programs, the FTCoE provides testing, evaluation and technology assistance to forensic laboratories and practitioners in the criminal justice community. NIJ supports the FTCoE to transition forensic science and technology to practice (award number 2011-DN-BX-K564).

FTCoE is led by RTI, a global research institute dedicated to improving the human condition by turning knowledge into practice. With a staff of more than 4,700 providing research and technical services to governments and businesses in more than 58 countries, RTI brings a global perspective. FTCoE builds on RTI's expertise in forensic science, innovation, technology application, economics, data analytics, statistics, program evaluation, public health and information science.

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OVERVIEW

The National Institute of Justice's (NIJ's) Forensic Technology Center of Excellence (FTCoE) at RTI International directed this effort, with support from industry, law enforcement, forensic and criminal justice system communities.

Purpose

A landscape study is designed to provide a comprehensive perspective on technology adoption, market participants and their products and product features to enable better-informed decisions by end users. This report provides a landscape of select mobile evidential breath alcohol instruments and factors impacting their implementation and use. Specifically, this report provides decision-makers and potential end users with the following:

- an overview of the technology and federal/state requirements
- exemplary situations that illustrate successful adoption
- lessons learned and key considerations for mobile instrument implementation
- comparisons of the capabilities of commercially available breath alcohol instruments

The following factors led the FTCoE to conduct a landscape study of breath alcohol instruments:

- A growing number of agencies recognize the convenience and time savings that mobile instruments offer in the processing of DUI subjects.
- Agencies recognize the added benefits of using mobile instruments as a means to provide an evidential breath alcohol record in a variety of locations.
- Agencies will benefit from an examination of how this technology is chosen and implemented, and they will also benefit from a study that reviews current product offerings, features and capabilities.

Several types of mobile evidential breath alcohol instruments are available to purchase from four key vendors: CMI, Inc.; Dräger Safety Diagnostics, Inc.; Lifeloc Technologies; and Intoximeters, Inc. For the purpose of this report, FTCoE has classified mobile evidential instruments as either transportable or handheld instruments. These terms may be used interchangeably within the international and national community, so the glossary provides definitions for each. Transportable and handheld instruments are used in the field and offer select advantages and disadvantages based on agency needs. This report explores features, adoption and implementation considerations and procedural contexts that provide a resource to assist law enforcement agencies in choosing the instrument that best meets their needs. A product table that provides an overview of features and specifications for select mobile evidential breath alcohol instruments from a variety of manufacturers is presented on pages 37-38 of this report.

Research Methodology

To conduct this landscape study, RTI used a process that included the following steps:

- Research secondary sources, including journal and industry literature, to obtain information related to need, successful use, developmental validation and adoption criteria.
- Create and disseminate a survey populated by end users to document current technologies in use.
- Conduct primary research of technology manufacturers, end users and subject matter experts.
- Document, summarize and release key findings to the law enforcement community.

Subject Matter Experts and Stakeholders

We would like to thank the forensic science community stakeholders and practitioners who offered insight, analysis and review. These participants were selected to represent a cross-section of stakeholders and subject matter experts to share their experiences in developing, marketing, using, or overseeing training programs with mobile evidential breath alcohol instruments.

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Glossary of Commonly Used Words and Phrases

Various resources were used to consider and define key terms, including the following:

1. The International Organization of Legal Metrology (OIML):
   a. https://www.oiml.org/en
2. The International Vocabulary of Metrology (VIM):
   b. http://www.bipm.org/en/publications/guides/vim.html

Some of the terminology from these resources is included below; however, both documents contain a more robust collection of definitions.

For the purpose of this document, the following terms are defined:

Adjustment: A set of operations carried out on a measuring system so that it provides prescribed indications corresponding to given values of a quantity to be measured.

Blood Alcohol Content (BAC): The amount of alcohol in a blood sample, typically expressed as the weight of alcohol in a specific volume of blood. In the U.S., the most common unit of measurement is milligrams (mg) of alcohol per 100 milliliters (mL) of blood.

Breath Alcohol Content (BrAC): The amount of alcohol in a breath sample, typically expressed as the weight of alcohol in a specific volume of breath. In the U.S., the most common unit of measurement is grams (g)/210 liters (L). The measurement mg/L is also used frequently, more often in European countries.

Calibration: An operation that, under specified conditions, establishes the relationship between the output of an analytical instrument and the relevant unit of measurement. Calibration is repeated at specified intervals to provide assurance that the instrument's performance is suitable for use.

Calibration Check (Accuracy Check/Verification): A test of an analytical instrument's ability to accurately report results of a known standard within a specified tolerance. It is sometimes referred to as an external calibration check. It is less involved than a calibration, frequently a single point at a single concentration.

Dry Gas Standard (Gaseous Ethanol): A pressurized cylinder containing gaseous ethanol mixed with an inert gas (usually nitrogen) for calibration and calibration check purposes.

Electrochemical Oxidation: A chemical oxidation reaction in which chemical energy is converted to electrical energy.

Evidential Breath Alcohol Instrument: An instrument designed to provide accurate, precise, and quantitative breath alcohol results when they are obtained after following a defined evidential testing protocol. Results obtained from these instruments are generally admissible in court and administrative proceedings.

Fuel Cell: A device designed to continually convert fuel and an oxidant into electricity in the form of a direct current (electrochemical oxidation).

Handheld Breath Alcohol Instrument: A breath alcohol instrument intended for use inside or outside buildings, generally operated while holding in one hand and generally powered by an autonomous battery.

Infrared (IR): A specific region of the electromagnetic spectrum consisting of wavelengths from approximately 1 millimeter (mm) to 750 nanometers (nm).

Mobile Breath Alcohol Instrument: A breath alcohol instrument intended for use in non-fixed locations. It comprises both **handheld** and **transportable** instruments.

Preliminary Breath Test Instrument: (also known as a screening device, pre-arrest breath tester, or PBT) A relatively inexpensive, handheld portable unit designed to provide a rapid approximation of alcohol concentration.

Residual Mouth Alcohol: Alcohol remaining in the mouth from recent drinking, or introduced into the mouth from the stomach, can impact a breath alcohol measurement result.

Stationary Breath Alcohol Instrument: A breath alcohol instrument intended only for use in a fixed location within buildings or places providing stable environmental operating conditions.

Transportable Breath Alcohol Instrument: A breath alcohol instrument intended for use in mobile applications (e.g., in vehicles) and easily transportable, but dependent on an external power source.

Wet Bath Simulator: A device that produces a known vapor alcohol concentration by passing air through a heated aqueous solution of known alcohol concentration. It is used for calibration and calibration check purposes.

INTRODUCTION

Overview of Mobile Evidential Breath Alcohol Instruments

History of Blood and Breath Alcohol Testing

Accidents caused by intoxicated drivers became a widespread issue in the late 19th century with the increased popularity of the automobile. In 1910, New York passed the first law banning the operation of a vehicle under the influence of alcohol.[1] In 1926, a provision that outlawed driving while intoxicated was added to the Uniform Vehicle Code (UVC), and, by 1936, 19 states had enacted similar regulations.[2] To fairly and effectively implement these laws, law enforcement entities needed new methods to identify individuals who were driving under the influence, as their current tests for drunkenness were subjective and reliant upon drivers exhibiting certain behaviors. To objectively measure the intoxication level of individuals operating vehicles, scientists began developing instruments that could quantify the amount of ethanol present in the subject's blood and breath.

Testing blood for the presence of ethanol is a straightforward process. When someone consumes an alcoholic drink, the ethanol from the beverage enters the bloodstream through absorption by the gastrointestinal tract.[3] Ethanol can be quantified from a blood sample using gas chromatography and mass spectrometry. In 1939, Indiana was the first state to pass a statute stating that blood alcohol concentration (BAC) was presumptive evidence of intoxication.[4] Although BAC tests continue to be helpful in enforcing laws against driving intoxicated, they are invasive, time-consuming, and require expensive laboratory equipment.

Like blood testing, breath alcohol testing is an effective method to measure the ethanol concentration of an intoxicated subject, but is a quicker and less invasive process, making it ideal for use by law enforcement. Ethanol circulating in the bloodstream is readily transported from the blood to the thin alveolar membranes in the lungs, and is released through expiration.[3] The amount of ethanol present in the alveolar air sample is proportional to the amount of ethanol present in the body. Breath alcohol concentration (BrAC) has been measured in a variety of ways as technology for law enforcement testing has developed over time.

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[1] Devine, J. (2008, July 17). *A brief history of DWI law*. Ezine Articles. Retrieved from http://ezinearticles.com/?A-Brief-History-of-DWI-Law&id=1335561

[2] NCUTLO: Uniform Vehicle Code and Model Ordinance, 41 C.F.R. §§ 50–204.75 (1968). Retrieved from https://law.resource.org/pub/us/cfr/ibr/004/ncutlo.vehicle.1969.pdf

[3] Garriott, J. C., & Aguayo, E. H. (2015a). Physiological basis and practice of breath alcohol determination. In *Garriott's Medicolegal Aspects of Alcohol* (6th ed.) (pp. 215-225). Tucson, AZ: Lawyers & Judges Publishing Company; Anderson C, Andersson T, Molander M. (1991). Ethanol absorption across human skin measured by in vivo microdialysis technique. Acta Dermato Venereologica.71(5):389-93. https://www.ncbi.nlm.nih.gov/pubmed/1684466

[4] Swartz, J. (2004). *Breath testing for prosecutors: Targeting hardcore impaired drivers*. American Prosecutors Research Institute. Retrieved from http://www.ndaa.org/pdf/breath_testing_for_prosecutors.pdf

The first modern breath alcohol device is often credited to Professor Robert F. Borkenstein, a captain with the Indiana State Police who, in 1954, developed the Breathalyzer.[4] The instrument measured the color change associated with the oxidation of potassium dichromate to determine the alcohol content of a breath sample. The Breathalyzer gained traction when several states established provisions allowing officers to conduct preliminary breath tests of a subject prior to arrest. Although the photometric component of the Breathalyzer introduced an unprecedented level of objectivity in quantifying BrAC, the instrument required the operator to adjust some settings manually using a dial. Therefore, these preliminary test results were generally inadmissible in court as evidence of intoxication due to the possibility of manipulation.

Current Breath Alcohol Technology

Today's evidential breath alcohol instruments contain a single or dual detector for alcohol. The two detector technologies most widely used in the U.S. are electrochemical fuel cell and infrared (IR) spectrometry.

IR-based breath alcohol instruments quantify the amount of alcohol in a sample by passing an IR beam through the sample and measuring the amount of energy absorbed at specific wavelengths. Molecules absorb different wavelengths of energy depending on structural characteristics. Ethanol absorbs strongly in the wavelength range of 3.3 to 3.5 micrometers (µm) and has another characteristic absorption band near 9.5 µm.

As air is expelled from the lungs during exhalation, the concentration of alcohol in the breath increases rapidly, then rises more slowly as the subject runs out of air. It is this final plateau-like portion of the exhalation, known as deep lung or alveolar air, that is the desired sample for a breath alcohol test as it provides the most consistent measurement of breath alcohol concentration. IR instruments are capable of continuous measurement over the course of exhalation. Therefore these instruments can determine the presence of the plateau by comparing consecutive measurements, and can also look for characteristic signal patterns caused by mouth alcohol. IR instruments are susceptible to interferences from other small molecules, including acetone, but can use multiple wavelengths and relative response ratios or filters to increase their specificity for ethanol.

In fuel cell–based breath alcohol instruments, alcohol in the breath sample is oxidized to acetic acid (releasing electrons in the process), thereby producing an electrical current. The strength of the resulting electrical current is directly related to the amount of alcohol in the sample. Fuel cell instruments are highly specific to ethanol but can be susceptible to small interferences from other alcohols that are low in molecular weight (e.g., methanol and isopropanol). Due to the nature of the fuel cell technology, these instruments are not susceptible to acetone interference. Unlike IR instruments, which measure continuously, fuel cell instruments measure BrAC at a single point during the exhalation process.

Early problems that limited fuel cell instruments to preliminary testing applications have been overcome with advances in technology. However, the instruments suffer from the perception that they are still afflicted by those limitations. Immediate predecessors to modern fuel cell instruments contained Taguchi cells, which are semiconductor sensors; not fuel cells. Semiconductor sensors are sensitive to partial pressures of gases and can therefore be unreliable with changes in temperature, pressure, and humidity, and are not suitable for evidential data collection. When electrochemical fuel cells first replaced semiconductor sensors they processed the electrical current using peak detection algorithms, meaning a device only registered the peak current reached after a sample was introduced to the fuel cell. As a fuel cell ages, the profile of the generated signal changes, and the peak signal attained decreases. By only detecting the peak signal, the instrument readings could become inaccurate over time and needed to be recalibrated regularly.

With advances in technology, the invention of microprocessors and their incorporation into fuel cell instruments prompted a drastic change in how the electrical current was processed. Modern fuel cell instruments record and integrate the entire electrochemical signal profile after a sample is introduced. As a fuel cell ages, the peak signal still decreases, but the integrated signal area remains constant, making today's measurements accurate and reliable.

Breath alcohol instruments have evolved to meet the end user's transparency and open-record needs by providing increased communication methods, record storage capacity, and record printing. Manufacturers must also consider the security of the testing system and integrity of data by installing anti-tampering measures. Current generation instruments employ modular electronic components, and are essentially computers with software and firmware required to perform complex algorithms that calculate the alcohol concentration and retain the resulting data. Due to the different needs and requirements such as regulations, statutes, local mandates, and historical protocols, breath alcohol programs frequently request that manufacturers provide unique software and firmware. These requests may be done during an initial evaluation process, as part of the procurement process, or due to changing needs.

Regulatory Environment

The laws surrounding alcohol-related driving offenses are complex and numerous; however, specific requirements for instruments examining BrAC are rare and not standardized across the U.S. Although the federal government provides a mechanism to approve federal workplace breath alcohol testing instruments, it does not specify any requirements for instruments used at the state and local levels. Many other countries rely on recommendations published by OIML.[6] The publication is currently under revision and widely seen as a means to standardize basic needs, such as power supplies and units of measurement, across different international economies. More recently, peer-reviewed journals have published outcomes from specific breath alcohol program protocols and validation experiments. With few published resources, breath alcohol programs have individually defined breath alcohol instrument specifications and designed validation studies to support the specifications. This has led to a wide variety in the breadth and depth of specifications and validations of breath alcohol instruments and calibration and testing methodology across the U.S. To fill this void, the Organization of Scientific Area Committees (OSAC) has worked on developing minimum standards for the calibration method and is planning future standards encompassing breath alcohol instrument specifications and the breath alcohol testing method.[7]

[6] International Organization of Legal Metrology (2012). *Internal recommendation, evidential breath analyzers.* OIML R 126 Edition 2012 (E). Retrieved from https://www.oiml.org/en/files/pdf_r/r126-e12.pdf.

[7] National Institute of Standards and Technology. (2016). *Toxicology subcommittee*. Retrieved from https://www.nist.gov/topics/forensic-science/toxicology-subcommittee

Conforming Products Lists

The National Highway Traffic Safety Administration (NHTSA) publishes the *Highway Safety Programs; Model Specifications for Devices to Measure Breath Alcohol* report. The current model specifications were published in the Federal Register in 2012.[8] They identify the minimum requirements and procedures used to evaluate instruments for inclusion on the conforming products list (CPL).[9] The CPLs are published by NHTSA and provides lists of instruments and calibration units approved for use to perform alcohol screening and confirmation tests under DOJ workplace testing laws (49 CFR Part 40). Although state and local law enforcement agencies are not required by the federal government to use instruments published on the CPL, most agencies use the CPL as a resource for selecting instruments, and manufacturers have typically chosen to submit their instruments for evaluation. Only devices listed on the CPL are eligible to be purchased using funds from the State and Community Highway Safety Grant Program, commonly referred to as section 402 grant funds.

The National Safety Council's Committee on Alcohol and Other Drugs (CAOD) was established in 1936 and has been active in making recommendations related to impaired driving.[10] The CAOD published *A Model Program for the Control of Alcohol for Traffic Safety* in 1967 and subsequently published recommendations regarding training technicians, supervisors and operators, as well as workplace testing and quantitative breath alcohol instrumentation. In 1994, Dr. Kurt Dubowski published best practices for a breath alcohol program that are still in use by many jurisdictions today.[11]

Use in Law Enforcement Settings

Alcohol-related driving arrests are among the most litigated cases in the nation. To justify suppression of breath test evidence in a court of law, criminal defense law firms may focus on training methods for, and administration of, test procedures, as well as maintenance of BrAC instruments. Failure to follow protocols established by state/local programs may result in evidence being inadmissible in court. The following sections highlight some of the ways law enforcement agencies choose high-quality breath alcohol instruments and ensure compliance to proper test and maintenance procedures.

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[8] Volpe. (2016). *Evidential breath tester (EBT) model specifications.* The National Transportation Systems Center. Retrieved from https://www.volpe.dot.gov/safety-management-and-human-factors/surface-transportation-human-factors/evidential-breath-tester

[9] U.S. Department of Transportation. (2012). *Conforming products lists of evidential breath testing devices, alcohol screening device, and calibrating units for breath alcohol testers.* National Highway Traffic Safety Administration. Retrieved from https://www.transportation.gov/odapc/documents

[10] National Safety Council. (2016). *Alcohol, Drugs, and Impairment Division*. Retrieved from http://www.nsc.org/join/Pages/division-alcohol-drugs-and-impairment.aspx

[11] Dubowski, K. M. (1994, October). Quality assurance in breath alcohol analysis. *Journal of Analytical Toxicology*, *18*(6), 306-311.

Customization of Instruments

> **"We both recognized the need and we worked together on the solution. We provided alpha, beta, and constant testing and feedback to the manufacturer during design, testing and implementation. The final product works amazingly well for our officers and we are thrilled with the partnership with the manufacturer to design the product, work out all the kinks and get it into production."**
> **— Matthew Gamette, Idaho State Police**

Although manufacturers offer breath alcohol instruments with a wide variety of options, off-the-shelf systems often do not meet the strict requirements and needs of specific breath alcohol programs. However, all of the manufacturers interviewed for this report indicated their willingness to develop customized systems for customers, and most have already done this for existing customers. Customization options include, but are not limited to, sample collection algorithms, accuracy check requirements, instrument response to a failed accuracy check, custom-printed report templates, and custom accessories. Costs associated with customization can be negotiated as part of the purchase price or, for large orders, may be covered by the manufacturer.

Evidential Breath Alcohol Training

> **"To assume that everyone is on the same level of technology understanding is not really a safe assumption."**
> **— John Styer, California DOJ**

Today's mobile breath instruments have achieved a level of technical sophistication that supersedes previous models in both functionality and design. Smart sensor technology, integrated safety checks, and mindful packaging have eliminated much of the guesswork when performing evidential breath alcohol tests on the roadside. For example, the handheld Dräger 7510 instrument gives specific reasons for test failures that are easy to understand, and has an operator manual physically printed on the instrument for reference. Many types of instruments are programmed to automatically cease function in response to a failed accuracy check, or periodically, so that they are taken to a forensic laboratory and recalibrated.

Although manufacturers offer high-quality transportable and handheld instruments for evidential use in the field, the integrity of the breath alcohol reading also depends on the law enforcement official's ability to operate the instrument. Regardless of their past experience with evidential breath alcohol instruments, law enforcement officials possess widely varying levels of technological acumen. The range of technical abilities emphasizes the importance of training programs implemented by state and local breath alcohol programs. Each agency interviewed for this report demonstrated intense dedication to the quality of their training programs so that their law enforcement officials could operate the instruments with the highest degree of accuracy and ease possible.

Operator training is an important aspect in breath alcohol instrument use. Operators must know how to effectively use the instruments, understand the legal requirements and protocols, troubleshoot unexpected events, and testify to the results when in court. Operators may perform quality assurance functions such as changing aqueous reference material or compressed gas canisters.

After purchasing an instrument, manufacturers provide training to state and local breath alcohol program staff. The training educates staff in instrument use, calibration, maintenance, and repair. Due to the sheer volume (i.e., thousands) of operators across each state, breath alcohol programs employ various ways of delivering operator training. Some programs train law enforcement operators at different strategic geographic locations, and others provide training solely at their laboratory facilities. Other breath alcohol programs use a “train-the-trainer” approach, in which the manufacturer or breath alcohol program trains a select group of individuals within law enforcement agencies who subsequently act as trainers for other officers. There is wide variability in training requirements among individual breath alcohol programs. Some operators may receive training once, while others are required to receive refresher training on a routine basis. Training courses are delivered in either an online format, a live in- person session, or a combination of both; for example, the state of Idaho trains their breath alcohol instrument operators using a web-based training program supplemented by a proficiency testing component administered in person.

DUI Test Procedures Overview

Most states have procedural requirements that must be met for an instrument’s test results to be submitted as evidence. ***Figure 1*** provides an example from the state of Missouri regarding the step-by-step procedure for using the Alco-Sensor IV with a printer for obtaining a BrAC result from a subject.

Generally, there are several steps in the testing process. It is important to understand and follow the specific procedures outlined by a respective law enforcement agency.

1. During a 15- to 20-minute alcohol deprivation period, trained personnel should observe the subject to ensure that no materials that could alter test results are ingested, and that no regurgitation or emesis occurs.
2. Analyze a blank sample prior to testing the subject or a control. This helps ensure no contamination from prior samples.
3. Analyze a known concentration sample to establish a control and demonstrate proper calibration of the instrument.
4. Document all steps followed via instrument printouts and checklists.
5. Document compliance with all applicable rules and regulations, routine maintenance and calibration records, any previous problems, and the actions taken to address the problems.
6. A recommended (but not always required) practice is to analyze two separate breath samples a few minutes apart. This helps to establish the absence of contaminants or other interference with the results.

Figure 1. State of Missouri DWI Procedures for the Alco-Sensor IV With a Printer

ALCO-SENSOR IV WITH PRINTER

1. Examination of mouth conducted. If any substance is observed or indicated to be present the substance observed or indicated must be removed prior to starting the 15 minute observation period.
2. Subject observed for at least 15 minutes by ______________________________. No smoking, oral intake or vomiting during this time; If vomiting occurs start over with the 15 minute observation period.
3. Make sure printer is connected to Alco-Sensor IV.
4. Turn printer on.
5. Insert mouthpiece into Alco-Sensor IV.
6. Observe temperature display, make sure temperature reading is between 10 C and 40 C.
7. When “BLNK” is displayed on Alcô-Sensoř IV, air blank is taken.
8. When “TEST” is displayed on Alco-Sensor IV, take subject breath sample.
9. When “SET” is displayed on Alco-Sensor IV, press SET button.
10. When printer has completed printing test result, tear off tape and fill in subject and officer information.
11. Press red button to eject mouthpiece.
12. Turn printer off.
13. Attach printout to this report.

Maintenance and Calibration

As technology has advanced, options associated with BrAC instruments, methodology, and data collection have increased. Breath alcohol programs (state or local) have the ability to define instrument specifications including choice of reference material, automation, testing schemes, and amount of data to collect and retain. The calibration and testing methods and reference materials are typically specified by the breath alcohol program, and most agencies conduct their own validation, calibration, adjustments, and calibration checks to ensure proper compliance. In addition, NHTSA maintains the *Highway Safety Programs; Conforming Products List of Calibrating Units for Breath Alcohol Testers*, which lists dry gas and wet bath calibrating units tested and approved by the agency.

Breath alcohol programs should validate the instruments and the calibration method prior to use for evidential breath alcohol testing. Validation is the initial process of ensuring that the methods and instrumentation chosen will reliably and repeatedly meet the breath alcohol program's needs. Instrument calibration is the process of verifying that the instrument meets all predefined criteria and is fit for its purpose. The calculation of measurement uncertainty and certificate issuance are required for a program to be accredited as a calibration laboratory.

An adjustment is the process by which known ethanol reference material is used to set (adjust) the instrument's response to match the ethanol concentration. Any adjustment to the instrument should be followed by calibration to ensure that the instrument meets all criteria for performance and to ensure the instrument's ongoing fitness for its purpose. Breath alcohol programs may use aqueous (wet bath) or compressed gas (dry gas) reference material to calibrate the instrument. The use of certified reference material provides confidence in the results due to the traceability to a national metrology institute, e.g. National Institute of Standards and Technology (NIST). This is typically a subset of the calibration method, perhaps a single concentration. Breath alcohol programs may perform a calibration check with each subject test and/or perform a calibration check when installing the instrument at a remote location.

Once a breath program determines the acceptability of an instrument, it is frequently entered into a statute, regulation, or program rule. Some breath alcohol programs purchase instruments for their geographic area, while other programs specify the instruments that may be used for evidential breath testing and require the end user to purchase instrument(s). The use of approved instruments, validated methods and quality control measures ensures confidence in the resulting breath alcohol tests. However, as each program individually defines its processes, comparing the validations and quality control measures across programs is difficult. Some programs have published their validation processes, either in peer-reviewed journals or in their standard operating procedures. Virginia Department of Forensic Sciences, Idaho State Police, and Missouri Public Health Laboratory, for example, maintain web- accessible versions of their Breath Alcohol Procedures manuals that can be referenced by other agencies.

Virginia Department of Forensic Science: *Breath Alcohol Procedures Manual*
http://www.dfs.virginia.gov/wp-content/uploads/2016/02/250-D100-Breath-Alcohol-Procedures-Manual.pdf

Idaho State Police Forensic Services: *Idaho Breath Alcohol Standard Operating Procedures*
https://www.isp.idaho.gov/forensics/documents/currentAMs/Breath%20Alcohol/Idaho%20Breath%20Alcohol%20SOP%20rev1.pdf

Missouri Department of Health and Senior Services: *Breath Alcohol Operator Manual*
http://health.mo.gov/lab/breathalcohol/pdf/TypeIIIOperatorManual.pdf

IMPLEMENTATION CONSIDERATIONS

Agencies considering the implementation of mobile breath alcohol instruments, including both transportable and handheld units, must weigh the benefits and hurdles of incorporating these instruments into field use. Interviews with jurisdictions that use and do not use mobile breath alcohol units have highlighted the technical, logistical, and practical factors that must be taken into consideration.

Key questions to ask when considering the adoption and implementation of mobile breath alcohol devices into a law enforcement agency:

Procurement

- How will the device be used in the field, and what advanced features are offered (e.g., printer and magnetic card reader)?
- How will this device improve the workflow for testing and processing DUI subjects?

Training

- What training is provided as part of the purchase price?
- What resources are provided (e.g., YouTube videos) for self-directed learning and training?
- What is the process for certifying officers to train their own staff?

Maintenance

- What kind of warranty is provided with the purchase of the device? Are extended warranties available?
- What software/hardware support is included in the purchase price of the device?
- Are incremental software upgrades covered? How much do major software upgrades cost?
- How is the maintenance of the device managed, and are there packages available from the manufacturer?
- How often does the device need to be calibrated?
- How well does the device accommodate the calibration requirements in the agency's respective state?
- Is a replacement of the device provided during service and/or calibration?

Potential Benefits

Evidential Measurement in the Field

Evidential breath alcohol measurements can be taken at or near the location where the subject was stopped, which allows for a reading to be obtained closer to the point at which the subject was driving. Agencies that use stationary instruments must transport the subject back to a station for testing, which can take upwards of 45 minutes and, as a result, the subject's breath alcohol concentration may not be equivalent to the level at which it was when he or she was stopped.

Time Savings during Investigations

Evidential breath alcohol tests using handheld or transportable instruments can be completed in the field within half an hour of when the subject was stopped. Testing on the roadside eliminates the need to transport subjects back to a station for testing. Depending on how far away a law enforcement official is dispatched from an agency or jail, roadside evidential breath alcohol testing could save anywhere from 10 minutes to 2 hours per investigation (based on a survey of more than 50 Idaho police officers). Note: although mouth alcohol detection methods are available on some mobile instruments, their use does not eliminate the need for a 15-20 minute observation period and/or two subject tests. Additionally, significant decreases to the time needed to conduct an investigation can be attributed to barcode scanners and magnetic strip readers in newer handheld and transportable models that populate forms with relevant information from a subject's driver's license and an officer's device permit, expediting the overall investigative process.

Versatile and Connected Instruments

Mobile instruments, including both transportable and handheld devices, can be used in the field or as replacements for stationary instruments in a laboratory or police station. Stationary instruments, on the other hand, cannot be used in a field setting. Today's breath alcohol instruments possess capability to use cloud-based applications through features such as Bluetooth connectivity. The devices can report all quality control and test data, providing a new means to address challenges with proper documentation during the breath alcohol testing process.

Lower Cost of Handhelds

Handheld breath alcohol instruments are more cost-effective than transportable or stationary models. Therefore, agencies can buy more of these handheld instruments than transportable or stationary instruments, which increases the number of breath alcohol instruments in the field and also increases access to a device when needed.

Potential Hurdles

Exclusively Fuel Cell Handhelds

Mobile breath alcohol instruments consist of handheld instruments and transportable instruments. Handheld instruments only use fuel cell technology to measure breath alcohol concentration, whereas transportable and stationary instruments use fuel cell technology, IR spectrometry, or a combination of both. Some states are required by law to use an evidential breath alcohol instrument that uses IR spectrometry, which limits the adoption of handhelds in these jurisdictions.

Limited Features in Handhelds

Transportable and stationary instruments possess a wide range of functions, such as automated diagnostics testing, more flexible printing options and a wider variety of preprogrammed testing algorithms, such as juvenile alcohol testing, than their handheld counterparts. These additional features can be appealing to agencies looking for top-of-the-line equipment.

Handheld Accuracy Checks and Calibrations

Transportable and stationary units can possess an internal reference material, which simplifies the process of calibration and accuracy checks. Due to their small size, handhelds require an external standard for accuracy checks and calibration. All breath alcohol programs require periodic calibration checks for breath alcohol instruments, with some mandating that one be performed within 24 hours of any breath alcohol test performed. Bringing handheld instruments from the field to a laboratory or station for this testing can be time-consuming and inconvenient for officers.

User Perception and Subsequent Treatment of Handhelds

Handheld instruments are typically stored in a vehicle and used on the roadside. These instruments are more likely to be dropped, tossed, left in extreme temperatures, or mishandled compared to transportable and stationary units. Routine calibration checks are critical to verify continued satisfactory performance of handheld instruments.

Perceived Difficult Transition of Station Protocols to Roadside

Some agencies that use stationary breath alcohol instruments find it difficult to perform evidential breath alcohol test procedures, which they are used to performing in a controlled station setting, on the roadside. For example, implementing the 15- to 20-minute mandatory observation period before the evidential test can be particularly challenging in the field, on the side of the road, where the safety of the officers and others may be compromised.

Cost and Process of Implementing New Instruments

The process to obtain state approval for a new breath alcohol instrument (which may or may not include altering state law), develop a protocol, and train users takes a significant amount of time and money. The effort it takes to introduce a new instrument into practice is difficult to justify when current instruments are functioning adequately and budgets are spread thin. Many state breath alcohol programs, which often take sole responsibility for instrument training and maintenance, lack the capacity to implement new instruments.

Limitations Posed by Field Conditions

Unlike the controlled environment of a law enforcement station, roadside testing takes place in a variety of environmental conditions. Although transportable and handheld evidential breath alcohol instruments are designed to handle most of these conditions, they have limitations. For example, most instruments are unable to take breath alcohol readings in extreme hot or cold temperatures. Similarly, altitude differences need to be taken into consideration. One interviewee mentioned that his jurisdiction's transportable units were sensitive to exhaust from a running vehicle's motor, which causes the instrument to detect an interference and shut down the test. Although these technological limits pose a challenge for law enforcement agencies only in very occasional circumstances, they do exist.

LESSONS LEARNED FROM USER EXPERIENCES

This landscape study provides several real-world examples of the implementation of mobile evidential breath alcohol instruments. The discussions captured in this study highlight the agencies' different needs and methods for adoption, technology features, and quality control.

Adoption

The flexibility of the laws and regulations associated with breath alcohol testing, which are state- and county-dependent, largely influences the ability of the jurisdiction to implement new (and, by extension, transportable/handheld) instrumentation. The following are examples:

- *Instrument technology:* Some states or counties mandate that evidential breath alcohol instruments must use a certain technology to quantify breath alcohol. For example, some states require that evidential breath alcohol instruments use IR absorption technology, which complicates the adoption of evidential handheld breath alcohol instruments, as these units exclusively use fuel cell technology.
- *Specificity of approved instruments*: Some jurisdictions list in their administrative code the specific breath alcohol instrument models that can be used for evidentiary purposes, so adopting new instrumentation requires this code to be amended. This process of changing regulation delays new instrument implementation and deployment. Conversely, state and local agencies that leave evidential breath alcohol instrumentation more open-ended, such as including a non-exhaustive list, can expedite new instrument implementation.

Examples of successful mobile evidential breath alcohol device adoption:

- The Tennessee Bureau of Investigation evaluates and approves evidential breath testing instruments, but does not explicitly state which devices are approved in an administrative code, facilitating the adoption of new evidential breath alcohol instruments.
- Adopting the EC/IR II (and later, the EC/IR II.t) in Arkansas did not require a change in state law. Although state law does contain a list of approved instruments, there is a mechanism that allows approval of new devices when they are evaluated and approved by a scientific team on the Board of Health. The Office of Alcohol Testing needs to issue a memo to approve the instrument for use by law enforcement.

Multiple breath alcohol programs have successfully translated breath alcohol protocols from an agency setting to the field, including those in Florida, Missouri, Tennessee, Idaho, and Orange County, California. These (and other agencies who have implemented evidential mobile breath alcohol instruments in their respective jurisdictions) can serve as examples and resources for states looking to transition to mobile evidential breath alcohol instruments. Some representatives of agencies who successfully adopted these instruments mentioned observing other trailblazer states and counties that used mobile evidential units before implementing the instruments themselves, which emphasizes the need to highlight success cases.

Technology Features

Most jurisdictions interviewed believe that handheld evidential breath alcohol instruments are just as technologically sound as their transportable and stationary counterparts. Thanks to advancements in technology and intuitive design, both handheld and transportable breath alcohol instruments ensure that a high-quality reading is produced and that the instruments are simple to operate. Due to their larger size, transportable and stationary instruments often possess more advanced features, such as diagnostic tools and internal standards.

Mobile breath alcohol instruments quantify BrAC through fuel cell technology, IR absorption technology, or both. Both types of detection methods possess unique implementation considerations for maintenance. For example, the fuel cell detector itself has a shorter life span than an IR detector, and needs to be replaced more frequently.

Quality Control

Quality control is critical to the success of a breath alcohol program. Agencies take steps to ensure that their evidential breath alcohol instruments are within strict tolerance levels and that their breath alcohol protocols are sound both at the station and in the field. Doing so ensures that the results accurately reflect the subject's alcohol concentration, which leads to confidence in the decision to prosecute or not. When used as evidence for alcohol-related offenses, a strong program of quality assurance provides the trier of fact (i.e., judge or jury) to have confidence in the breath alcohol result in order to make an informed decision.

All breath alcohol instruments require periodic calibration checks. Good calibration check logs are vital. Many cases are lost due to incomplete record keeping. For transportable and handheld evidential breath alcohol instruments that use external standards for calibration checks, the instruments must be periodically united with an external standard. The frequency with which calibration checks must be performed varies widely between programs and can be based on a set number of days or the number of samples an instrument has measured. The agencies interviewed for this report required calibration checks on handheld instruments at a range from every 30 days (or 150 tests) to up to 24 hours after every test. The required frequency of these checks affects how logistically feasible it is for agencies to bring handheld and portable instruments back to the station for calibration checks. For example, officials in the San Diego Sheriff's Department, whose instruments are required to be checked every 10 days, found it challenging to deploy handheld and transportable instruments in the field with high-frequency calibration checks.
Other rural agencies addressed this issue by allowing officers to keep external standards at their homes and perform calibration checks nightly.

USER PROFILES

Subject Matter Experts' Insights from Product Experiences During Trial Testing, Implementation and Use

This section provides examples of the successful implementation of mobile evidential breath alcohol instruments to illustrate benefits, present potential adoption issues, and provide examples of ways to overcome adoption barriers. The user profiles offer insights on the means by which the technology has been an effective tool for law enforcement agencies. Key impacts and lessons learned are highlighted, followed by examples of successes from the implementation of mobile evidential breath alcohol instruments.

CMI INC. Intoxilyzer® Lifeloc TECHNOLOGIES Intoximeters Experience · Service · Integrity Dräger

Title: The Arkansas Department of Health's Office of Alcohol Testing (OAT) is Implementing the Use of Intoximeters, Inc.'s Transportable EC/IR II.t

Contributor: Laura Bailey serves as the Director of the Office of Alcohol Testing for the Arkansas Department of Health.

Use Profile: Prior to 2009, the BAC DataMaster (manufactured by the National Patent Analytical System) was approved by the OAT for use in evidential breath alcohol testing. In 2009, the OAT approved Intoximeters, Inc.'s EC/IR II. In Arkansas, law enforcement agencies are responsible for purchasing instrumentation and until April 2011, both instruments were approved for use. After that date, only the EC/IR II was allowed for use in evidential breath testing. In 2016, the OAT approved a mobile version for evidential testing — Intoximeters, Inc.'s EC/IR II.t. A grant from the Arkansas State Police's Office of Highway Safety provided the funds to purchase five of the evidential mobile instruments. These instruments will be dispersed through the state to provide increased testing ability. The plan is to obtain five additional mobile evidential units (using similar grant funds) each year to increase saturation in the state.

> **"Mobile testing allows for a test close to time of driving, which will hopefully lead to fewer challenges in court."**
> **— Laura Bailey**

Officers have found the transportable device to be useful for increasing accessibility to evidential breath testing equipment. In remote and hilly areas of the state, transporting a subject to the station for testing could take hours because there may be just one officer working the stop or accident. The EC/IR II.t should significantly decrease the time necessary to obtain an evidential breath test in these areas. The instrument has shown to be functional in various weather and position conditions. Additionally, the officers like the fact that if someone is close to the *per se* level (legally defined alcohol concentration — all states currently have their *per se* level set at 0.08 percent), valuable time will not be lost in obtaining an evidential result.

Although officers testing out the transportable EC/IR II.t were impressed by the novelty and convenience of a mobile instrument, there is still a disconnect in understanding the intended use of the instrument. Some agencies believe that these instruments are only for use in specialized situations such as sobriety checkpoints, and fail to recognize the potential of these devices in everyday roadside testing situations. The OAT is a small department solely responsible for training all operators and performing onsite instrument inspections. The department has not implemented evidential handheld instruments in the same manner in which it has implemented preliminary breath testers (PBTs) because staff do not have the capacity to test, certify and deploy these devices.

Device Impact:

- Decreases the time between apprehending a subject and obtaining an evidential breath test, which provides the closest account of a subject's BrAC when driving.
- Avoids the need to transport the subject back to a station, which is time-consuming and inconvenient.
- Is rugged and well-suited for field use.

Lessons Learned:

- Functionality is just as important as portability of evidential breath alcohol instruments; transportable breath alcohol devices can offer a more sophisticated range of features than handheld instruments.
- The resources and capabilities of the organizations implementing a breath testing program in each state influence the type of breath alcohol instrumentation used and the state's ability to change models.

Title: Missouri Police Departments, Along With the Missouri State Highway Patrol, are Transitioning to Intoximeters, Inc.'s Handheld Alco-Sensor IV

Contributor: Tracey Durbin is the Drug Recognition Expert (DRE)/Standardized Field Sobriety Test (SFST) State Coordinator for Missouri. He works for the Missouri Safety Center (MSC) at the University of Central Missouri.

Use Profile: Missouri police agencies began adopting handheld devices when they observed that officers were less likely to apprehend and test a subject for breath alcohol if an evidential breath alcohol instrument was not readily accessible. Prior to the use of evidential handheld devices, police departments used stationary instruments, including Intoximeters, Inc.'s DataMaster Model K and EC/IR II; CMI Intoxilyzer 5000; and the transportable Intoxilyzer 8000. Currently, approximately 150 Alco-Sensor IV instruments are being used in the field, located in police cruisers or breath alcohol testing vans, and 90 more are in inventory waiting to be assigned.

> **"Using evidential handhelds, Missouri's goal is to enable officers to always be within 10 minutes of a breath tester anywhere in the state."**
> **— Tracey Durbin**

Agencies have appreciated the portability of these devices. Rather than transporting the subject to a station to perform the evidential test, officers can obtain evidential test results on the roadside within approximately 20 minutes of the start of the investigation, which saves time. The MSC is currently looking into the Alco-Sensor VXL as a future handheld option; using a card reader, the instrument automatically populates the information from the subject's driver's license and the officer's permit, saving time and energy. The ability to print records in the field using the VXL model is another incentive for switching to the newer model.

Missouri police agencies have found these handheld instruments to be high in quality and durable. Mr. Durbin has demonstrated that the device operates within the allowed variance even after being thrown out of a vehicle moving at 60 miles per hour.

The MSC offers rigorous training courses for two types of users: (1) type II supervisors, who can operate the instrument, calibrate it, train other users, and defend methodology in court; and (2) type III operators, who can use the instrument in the field.

Device Impact:

- The portability of the handheld evidential breath alcohol instrument has decreased the duration of DUI investigations and has allowed for testing subjects closer to the point at which they were stopped.
- The handheld instrument's low cost (compared to the price of transportable and stationary breath alcohol devices) has allowed for wide distribution.

Lessons Learned:

- Time saving is an important benefit to police departments regarding breath alcohol testing. Handheld evidential breath alcohol instruments introduce efficiency into multiple facets of a DWI investigation.

Title: Idaho State Police Forensics Use the Handheld Lifeloc FC20 and Transportable Dräger Alcotest 9510 as Evidential Breath Alcohol Instruments

Contributor: Jeremy Johnston is the Volatiles Analysis Discipline Leader for the Idaho State Police Forensics Services. Matthew Gamette is the Laboratory System Director for the Idaho State Police Forces.

> **"Consistency of results and the low cost of the FC20 are two of the main reasons why we prioritize use of FC20 in our department."**
>
> **— Jeremy Johnston**

Use Profile: The Idaho State Police has been using handheld evidential breath alcohol devices since the 1980s. It uses four different types of evidential breath alcohol devices: the stationary CMI Intoxilyzer 5000 and 5000EN; Intoximeters, Inc.'s handheld Alco-Sensor III; the transportable Dräger Alcotest 9510; and the handheld Lifeloc FC20.

The Dräger Alcotest 9510 is replacing aging stationary instruments at the law enforcement station. The Idaho State Police switched to the 9510 to take advantage of the device's dual-detection technology, which quantifies breath alcohol levels using both fuel cell and IR technology, thereby increasing the accuracy of the reading. In addition, the ability for Dräger instrumentation to be networked into a cloud application for data storage influenced the state's decision to implement this model. This feature allows Idaho State Police to monitor instruments remotely and post historical trend data on their website for both prosecution and defense.

Since 2005, the FC20 has been used as the primary handheld evidential breath testing device. The department appreciates the convenience and high quality of the FC20 units. Mr. Johnston praised the consistency of results and low cost of the FC20 as two of the main reasons why the department has prioritized use of the FC20.

The Idaho Administrative Procedures Act (IDAPA) mandates that evidential handheld breath alcohol devices be checked for accuracy within 24 hours of test administration, representing the most frequent accuracy check requirement of all the agencies interviewed. The Idaho State Police found that the most convenient feature of the Lifeloc FC20 is the EASYCAL calibration station, which automates the process of external handheld device calibration and calibration checks. The EASYCAL calibration station is a user-friendly device that is significantly cheaper and easier than performance verification through the standard wet bath simulators. Since Idaho is such a rural state, officers can be dispatched up to 4 hours away from their district, so many EASYCAL systems are located in the homes of resident troopers to simplify the calibration check process.

One challenge users must manage is the lack of specificity with regard to error readings associated with the device, thus making troubleshooting with the DUI subject difficult. For example, if a subject produces a breath sample that is insufficient, it could be attributed to multiple factors, such as the subject failing to produce 1.3 liters (L) of breath, the subject failing to blow into the device hard enough, or the breath failing to trail off naturally. Officers are extensively trained to be able to effectively manage these issues and troubleshoot instruments to provide the evidential data required for prosecution in a court of law.

As is the case with any complex device, the FC20 can operate only as well as it is treated by the user. In some cases, these units have been left in a cruiser in extreme hot or cold conditions, or rattled around in the backseat of the car. These actions may result in damage to the device, resulting in failed accuracy checks and a decreased life span of the device.

Device Impact:

- Roadside testing using handheld evidential devices decreases the duration of a DUI investigation by eliminating transportation of the subject back to a station.
- The EASYCAL calibration system makes deploying evidential handheld breath alcohol devices possible when they must be checked for accuracy within 24 hours of a test.
- Dual detection technology of the Dräger Alcotest 9510 provides very accurate breath alcohol readings.
- Cloud-based data storage enables the Idaho State Police to monitor instruments remotely and publish informative historical data of the FC20 instruments on their website.

Lessons Learned:

- Operator knowledge of the FC20 is critical to enabling proper troubleshooting so that accurate and evidential data may be acquired from DUI subjects.
- Proper care of the FC20 inside patrol cars is required for maximum performance and product longevity.
- Idaho is a good example of wisely choosing evidential breath alcohol devices to implement handheld devices while accommodating state regulation. Lifeloc's EASYCAL system allowed the Idaho State Police to deploy handheld devices while still observing the IDAPA code to check the device for accuracy up to 24 hours after each test.
- Extensive validation of breath alcohol instruments is essential. The requirements for workplace testing and evidential testing are quite different and validation of every aspect is necessary to ensure breath alcohol testing in Idaho meets their needs.
- Keeping a significant number of officers certified on these instruments presents significant logistical challenges.

Title: Wisconsin's State Patrol Uses Intoximeters, Inc.'s Transportable EC/IR II.t Instrument for Evidential Use in Environmentally Challenging Areas

Contributor: Susan Hackworthy is the Chemical Test Section Chief for the Wisconsin State Patrol in the Wisconsin Department of Transportation.

Use Profile: The Wisconsin State Patrol uses Intoximeters, Inc.'s stationary EC/IR II evidential breath alcohol instrument, and has recently purchased 15 transportable EC/IR II.t instruments for use by the Wisconsin Department of Natural Resources (WDNR). WDNR wardens use the EC/IR II.t instruments in areas such as state parks, where individuals occasionally boat, hunt, and snowmobile under the influence of alcohol. In the field, these breath alcohol instruments use AC or DC power, so they are capable of being used in a law enforcement vehicle, a trailer, or an office setting.

> **"The accuracy, precision, and reliability of the EC/IR II has been well established, and the EC/IR II.t gives the same technology in a more portable format."**
> **—Susan Hackworthy**

Ms. Hackworthy finds that the EC/IR II.t transportable evidential breath alcohol instrument possesses the high standards for accuracy and precision as well as the safeguards found in the stationary EC/IR II instrument, but with the added convenience of portability. Per Wisconsin administrative code, evidential breath alcohol instruments must undergo an accuracy check between a subject's two sample tests. The dry gas standard used with the transportable EC/IR II.t instrument allows the accuracy check to be performed in the field, which ensures the accuracy of the test at the time it is taken. Although the instrument is used in a nontraditional setting, wardens are careful to ensure that they operate the EC/IR II.t in a controlled environment, and not only does the instrument have temperature monitoring of its sampling system and dry gas delivery system, the operators are supplied with thermometers for vigilant ambient temperature monitoring. The EC/IR II.t enables the state of Wisconsin to maintain its high-quality breath program for use in the field.

Device Impact:

- The incorporated dry gas standard allows the accuracy check to be performed between subject samples in the field.

Lessons Learned:

- The EC/IR II.t transportable instruments possess safeguards and features that are identical to their stationary counterparts, including options not available on handhelds.

Title: The San Luis Obispo Sheriff's Office Uses Handheld Dräger 7510 Breath Alcohol Instruments in the Field

Coordinator: Lauren Lewis is a Forensic Lab Specialist at the San Luis Obispo Sheriff's Office.

Use Profile: San Luis Obispo County uses the Dräger Alcotest 7510 breath alcohol device in the Dräger Alcotest 8610 kit, which comes with a 7510 device, a Dräger mobile printer, keyboard, magnetic card reader, mouthpieces, batteries, and printer paper. The jurisdiction purchased these kits using grant funds allocated to purchase mobile evidential breath alcohol instruments, and chose to adopt Dräger instrumentation as a result of another organization having previously implemented the handheld 7510 devices within nearby jurisdictions. Forty units have been purchased and distributed throughout the county, with each agency averaging about two devices.

> **"We really like the quality of the Dräger 7510 instrument, especially its features such as detecting mouth alcohol."**
> **— Lauren Lewis**

The agencies in the county that use the Alcotest 7510 in the field note that it expedites the process of initial subject contact, evidential breath alcohol testing, and the subsequent determination of whether or not to take the subject to the police station for further investigation. The county has successfully transitioned its traditional stationary breath alcohol protocol to roadside testing. A notable feature of the Alcotest 7510 is its ability to detect mouth alcohol in a sample through a piezoelectric activator. The device takes two readings of the subject's breath, with one initial sample and the second captured 200 milliseconds (ms) after the subject begins blowing. A larger first reading indicates the possibility of mouth alcohol, which helps to ensure an accurate reading. Another quality control measure in the Alcotest 7510 has a built-in timer, which indicates that the device must be brought to a forensics laboratory and calibrated periodically, regardless of its performance during calibration checks. Agencies are happy with these devices and have experienced no major problems operating them.

Mr. Lewis completed a rigorous training session at Dräger's manufacturer facility in Texas. He is responsible for training around 330 law enforcement officials in the county on Dräger 7510 instruments.

Device Impact:

- Alcotest 7510 detection of mouth alcohol adds another layer of quality and accuracy to evidential breath testing using handheld devices.
- A handheld evidential breath alcohol device can decrease the time necessary to perform a DUI investigation.

Lessons Learned:

- Evidential breath alcohol device adoption of surrounding areas can influence another jurisdiction's device adoption.
- Jurisdictions can have designated trainers take the in-depth training from manufacturers and then return to their location to train larger groups of officers.

Title: The Florida Department of Law Enforcement Has Been Using the Transportable Intoxilyzer 8000 Since 2006

Contributor: Dr. Patrick Murphy is a Department Inspector in the Alcohol Testing Program at the Florida Department of Law Enforcement.

Use Profile: The Florida State Police had been using 14 different brands of evidential breath alcohol devices until the state switched over to a single instrument, the CMI Intoxilyzer 5000C, in 1999. In 2006, the state shifted to exclusive use of the transportable CMI Intoxilyzer 8000. This evidential transportable model was chosen due to its ease of mobility and versatility in stationary, roadside, and marine settings. Florida law requires that officers must prove that the subject was over the legal limit at the specific time when he or she was stopped by police, and these transportable devices make evidential breath testing readily accessible in a wide variety of settings.

> **"The Intoxilyzer 8000 has proven to be a dependable evidential device for use in both land and water settings."**
> **— Dr. Patrick Murphy**

Law enforcement officials have found the Intoxilyzer 8000 to be high in quality, dependable, and functional in a variety of environmental conditions. Use of the instrument decreases the duration of these investigations, but the exact time needed for use depends on the law enforcement official's ability to type quickly. Concerns regarding the durability and maintenance of handheld devices were factors that influenced the decision of the Florida Department of Law Enforcement to select the Intoxilyzer 8000 for use in the field.

Device Impact:

- ❖ Transportable evidential devices enable Florida law enforcement officials to extend their range of policing, to areas such as marine environments, while ensuring that applicable laws regarding DUI processing are followed.

Lessons Learned:

- ❖ Agencies are concerned about the durability and maintenance of handheld devices.
- ❖ The exclusive use of one evidential testing device for the agency simplifies the training, use, and maintenance logistics.

Title: Orange County Police Have Been Using Intoximeters, Inc.'s Alco-Sensor Instruments as Evidential Breath Alcohol Tests for More Than a Decade

Contributor: Matthew Nixt is a Senior Forensic Scientist in the Forensic Alcohol Division in the Orange County Crime Laboratory, in Orange County, California.

Use Profile: Orange County switched from the stationary National Patent Analytical Systems' DataMaster evidential breath alcohol instruments to Intoximeters, Inc.'s handheld Alco-Sensor IV-XL in 2003 and is currently in the process of deploying the handheld Alco-Sensor VXL. The device enables officers to complete roadside sobriety tests well within the 3-hour presumption time.

> **"The versatility of the Alco-Sensor VXL suits the evidential testing needs of agencies both in the station and in the field."**
> **— Matthew Nixt**

Handheld evidential instruments are widely dispersed and accessible; if an officer's device is not functioning, a nearby officer can provide another instrument quickly. Versatility is another benefit of handheld devices; these instruments can be used for evidential breath alcohol testing in the field and at the law enforcement agency. This suits a county whose agencies have varying preferences for roadside and station testing. Officers have found the Alco-Sensor models to be durable and accurate, even in near-freezing conditions.

One challenge associated with using evidential handheld devices is the frequency with which calibration checks are required. Stationary evidential breath alcohol devices, which have an internal standard, automatically perform a calibration check before every test. Handheld devices need to be tested manually with an external standard on a weekly basis. Scheduling and documenting these calibration tests can be challenging to manage. Many DUI defense attorneys request to examine the accuracy records of the devices, so it is very important for law enforcement agencies to keep precise records.

Orange County has implemented a unique software function to serves as a failsafe to ensure collection of accurate data. If an accuracy check fails, the device shuts down and locks the user out. The device cannot be used until it is brought back to the forensic laboratory and tested, fixed, and reset. This decreases the possibility of obtaining an inaccurate reading in the field.

Device Impact:

- The device is versatile. The handheld can be used as a mobile evidential device in the field but also can also function like a stationary evidential breath alcohol device in the stations.
- The unique software function acts as a failsafe, preventing the use of inaccurate evidential instruments in the field.
- The automatic shut-off function in response to a failed accuracy check helps ensure that the handheld is working properly.

Lessons Learned:

- For handheld evidential breath alcohol devices, agencies must weigh the benefits associated with the convenience of portability with the required frequency of calibration checks.
- Forensic crime laboratories possess a responsibility to the criminal justice system to provide instruments that are accurate, while putting together quality policies and procedures to help ensure this.

Title: Law Enforcement Agencies, Under a Memorandum of Understanding (MOU) with the California Department of Justice, in the Central Valley Region and Other Areas of California, Use the Dräger Alcotest 7510 for Evidential Breath Tests

Contributor: John Styer is a Senior Criminalist and Breath Alcohol Program Coordinator in the Bureau of Forensic Services (BFS) Central Valley Laboratory in California.

Use Profile: The BFS Central Valley Laboratory serves the California counties of Calaveras, Merced, San Joaquin, Stanislaus, and Tuolumne. The region used the stationary CMI Intoxilyzer 5000 model, owned and maintained by BFS, until 2000, when agencies were switched to handheld evidential breath alcohol instruments (Dräger Alcotest 7410). Currently, approximately 180 Dräger Alcotest 8610 units are in operation in the Central Valley, and include the Dräger Alcotest 7510 instrument, Dräger mobile printer, keyboard, magnetic card reader, mouthpieces, batteries, and printer paper.

> **"I have great confidence in the reliability of the Alcotest 7510."**
>
> **— John Styer**

Officers appreciate multiple aspects of the instrument that make these units easy to operate. For example, the intensity of the screen can be adjusted so the instruments can easily be read in conditions with either low light or direct sunlight. When the instrument does not receive a satisfactory sample from a subject, the sample will not be analyzed, and the reason not analyzed will be shown on the screen of the instrument in full-text English instead of error codes. There is an operational manual provided with the instrument, as well as a precautionary checklist integrated into the software of the 7510 for reference. Changing the paper in the new ribbon-less printer also takes minimal time and effort. The replacement of the stand-alone Casio (Alcotest 7410) by an integrated computer system (Alcotest 7510) eliminated about 50% of breath instrument downtime.

Mr. Styer recommends that an agency consider the benefits of time savings in the field that mobile evidential breath alcohol instruments offer with the logistics associated with conducting calibration checks on each unit. The state of California requires that evidential breath instruments be checked for accuracy at least every 10 days or 150 subjects. This responsibility typically falls on the agency using the instruments and can be time-intensive. Uploading data from the 7510 usually takes about 7 minutes per instrument.

Device Impact:

- The easy-to-read, adjustable screen suits a variety of light conditions on the roadside.
- Troubleshooting is made easier through error feedback given in plain English.
- The printer is easy to use.
- The device uses commonly available AA batteries (rechargeable or alkaline).

Lessons Learned:

- Even if mobile instruments save time on investigations in the field, these time savings can be offset by the time it takes for the agencies to manually perform calibration checks and upload data from the instruments.
- Dead printer batteries render the system inoperable. Battery maintenance is very important.

Title: The Tennessee Bureau of Investigation Has Implemented Intoximeters, Inc.'s Handheld Alco-Sensor VXL Since 2014

Contributor: Samera Zavaro is a Special Agent/Forensic Scientist Supervisor for the Breath Alcohol Section at the Tennessee Bureau of Investigation.

Use Profile: The Tennessee Bureau of Investigation (TBI) began implementing Intoximeters, Inc.'s Alco-Sensor VXL with a printer in the field around 2010. Previously, agencies were using Intoximeters, Inc.'s stationary EC/IR II instrument. The TBI was influenced to incorporate the handheld instruments into its breath alcohol testing program as the larger, heavier EC/IR II instruments were aging and needed more repairs.

> **"The officers love the Alco-Sensor VXL because they are lightweight and easy to use."**
>
> **— SA Samera Zavaro**

The TBI purchases these instruments for agencies via a grant provided by the Governors Highway Safety Association. Some counties have stronger adoption rates than others. Shelby County uses around 60 Alco-Sensor VXLs, and Davidson County uses around 20 devices. Agencies are pleased with the portability and functionality of the instrument, especially the younger police officers, who appreciate the ease of use of the lightweight device. For example, the automatic population of information from swiping driver's licenses and officer operator permit cards decreases the amount of typing required by the officer. The TBI is responsible for training all operators of the Alco-Sensor VXL and troubleshooting the equipment; to date, the TBI has trained around 104 operators on the handheld device. The TBI has also been pleased with Intoximeters, Inc. for its prompt response and support with technical issues.

Agencies have found the Alco-Sensor VXL to be durable in a field setting but have noticed that the handheld instruments may be more prone to falling out of calibration than the EC/IR II instruments. To address this concern, the TBI is looking at data points to determine if there is a specific trend that can be addressed.

Device Impact:

- The user-friendly features of the Alco-Sensor VXLs save time by decreasing the amount of typing required by the officer and by allowing roadside testing to occur.

Lessons Learned:

- Observation of states and counties using mobile breath alcohol devices can influence jurisdictions to adopt mobile evidential breath alcohol devices.

MOBILE EVIDENTIAL BREATH ALCOHOL PRODUCT LANDSCAPE

Hardware Features

Traditional stationary evidential breath alcohol instruments found in law enforcement agencies are large and immobile, necessitating transportation of the subject to the station for evidential breath alcohol testing. Mobile evidential breath alcohol instruments, which include both transportable and handheld instruments, are packaged to enable convenient use in the field. Important features include the following:

- **Size and Weight:** Mobile evidential breath alcohol instruments are smaller and lighter than traditional stationary models. Transportable units can comfortably fit in the front seat of a cruiser and come with carrying cases and/or handles. Handheld units are small and light enough to fit in the palm of the hand and in a pocket.
- **Power Source:** Handheld instruments rely on self-contained batteries, while transportable instruments rely on power from a vehicle's 12 volt (V) socket.
- **Display:** Most transportable and handheld breath alcohol instruments have a backlit LCD display that allows for readability in low-light conditions, such as nighttime stops.
- **Ruggedness:** Mobile breath alcohol instruments, especially handheld instruments, have been designed with field use in mind. These instruments are usually constructed from impact-resistant Acrylonitrile Butadiene Styrene (ABS) plastic, and some meet typical International Electrotechnical Commission (IEC) drop, shock, and vibration standards such as IEC 68-29Eb, 6Fc, 64Fh, and 27Ea.
- **Data Storage and Network Connectivity:** Instruments have evolved to meet the end users' transparency and open record needs by providing increased communication methods (with internal modems; Ethernet, USB, IR, and RS-232 ports; and Bluetooth connectivity), record storage capacity, and record printing.
- **Accessories:** Law enforcement agencies can choose from a wide range of accessories to supplement their breath alcohol testing device. These may include docking stations for handheld instruments, keyboards, smartcard and magnetic card readers, 2D bar code scanners, mounting adapters, magnetic grips, or carrying cases.

Software and Firmware Features

The software and firmware installed on each breath alcohol instrument are critical to its function as an evidential device. Breath alcohol test, calibration check, and calibration protocols are unique to each state or county, and these testing components of the instrument are hardcoded into the software and firmware. These codes are proprietary for each manufacturer. Once individual test and calibration protocols are set, they may not be changed without a revision to the software/firmware.

Individual calibration and calibration check protocols may include, but are not limited to, the following:

- source of the reference material (compressed gas or aqueous solution)
- timing and sequence of the calibration method
- calculation method for the result(s) (e.g., truncating the number of digits or rounding)
- complete or partial automation

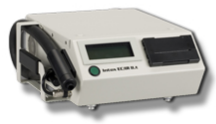
- acceptance criteria (e.g., bias and precision)
- shutting off and locking in response to a failed accuracy check

Individual test protocols may include, but are not limited to, the following:

- number of subject breath samples required
- use of reference material for verification
- source of the reference material (compressed gas or aqueous solution)
- timing and sequence of the subject test method
- evaluation of interfering substances
- calculation method for the result(s) (e.g., truncating the number of digits or rounding)
- appearance of the result(s) (e.g., the units of the result and whether it is printed)

Table 1. Overview of Features for Select Mobile Evidential Breath Alcohol Instruments

Cost $: 800-1,200 $$: 7,000-9,000 $$$: > 9,000	Intoximeters Experience · Service · Integrity		Dräger		CMI Inc. Intoxilyzer	Lifeloc Technologies
Mobility	**Handheld**	**Transportable**	**Handheld**	**Transportable**	**Transportable**	**Handheld**
Model	**Alco-Sensor VXL**	**Intox EC/IR II.t**	**Alcotest 7510**	**Alcotest 9510**	**Intoxilyzer 8000**	**FC20**
						
Cost	$	$$	$	$$$	$$	$
Type of Sensor	Fuel Cell	Fuel Cell and IR (dual wavelength infrared analyzer)	Fuel Cell	Infrared (with optional dual system with fuel cell technology)	Infrared Absorption	Fuel Cell
Sensor Range	0.000-0.440 g/210 L	0.000-0.440 g/210 L	0.000-0.630 g/210L	0.000-0.630 g/210L	0.000 to 0.600 g/210 L	0.000 to 0.600 g/210 L
Weight	0.75 pounds	11.2 pounds	0.86 pounds	15.2 pounds	17 pounds	0.50 pounds
Data Storage (standard)	Up to 7,000 test records	Up to 4,000 test records	Up to 5,000 test records	16 MB	2 MB	Up to 4,000 test records
Calibration	Dry gas and wet bath	Dry gas and wet bath	Dry gas and wet bath	Dry gas and wet bath	Dry gas and wet bath	Dry gas and wet bath
Power Supply	Four AA batteries, either alkaline or NiMH rechargeable cells	DC internal power, compatible with 11-16 V DC or 90-270 V AC	Four AA batteries, either alkaline, NiMH rechargeable cells, or lithium ion batteries	12 VDC and 85-260 VAC	DC internal power, compatible with 10-16 V DC or 90-264 V AC	Four AA batteries, either alkaline or NiMH rechargeable cells
Data Management Software	Alco-Sensor VXLerator or IntoxNet	IntoxNet	Draeger Diagnostics	ComHub	COBRA	AlcoMark
Warranty	One year	One year	One year	One year	One year	One year instrument, lifetime fuel cell warranty
Calibration: Internal/External	External	Both (optional dry gas carrier)	External	Both (optional dry gas carrier)	Both (optional dry gas carrier)	External
Communication	Optional Bluetooth capability, optional serial to Ethernet adapters	Two RS-232 serial ports, parallel port, optional serial USB/ Ethernet adapter	Communication via IR to printer, USB	USB, RS-232 ports, Ethernet, modem port, IR port	Optional internal modem, two RS-232 ports, Bluetooth, USB host, Ethernet	Optional Bluetooth capability, serial interface
Operating Temperature Range	0 to 50 ^{o}C	-10 to 50 ^{o}C	-10 to 50 ^{o}C	0 to 40 ^{o}C	0 to 40 ^{o}C	0 to 55 ^{o}C

Cost $: 800-1,200 $$: 7,000-9,000 $$$: > 9,000	Intoximeters Experience · Service · Integrity		Dräger		CMI Intoxilyzer	Lifeloc Technologies
Mobility	**Handheld**	**Transportable**	**Handheld**	**Transportable**	**Transportable**	**Handheld**
Model	**Alco-Sensor VXL**	**Intox EC/IR II.t**	**Alcotest 7510**	**Alcotest 9510**	**Intoxilyzer 8000**	**FC20**
						
Cost	$	$$	$	$$$	$$	$
Battery Life	1,500+ tests	N/A	1,500 tests	N/A	N/A	Up to 6,000 tests (160 hr life)
Printer	External thermal printer (can be Bluetooth enabled)	Internal thermal printer	External Draeger thermal printer (IR communication)	Internal thermal printer	Internal thermal printer	External thermal printer
Display and Controls	Multi-color backlit LCD display	Backlit LCD display	Transreflective backlit LCD display	High-res color touchscreen	Vacuum fluorescent display	Backlit LCD display
Dimensions	7.5" x 4.0 " x 2.2"	14.5" x 14.5" x 6.25"	5.8 " x 2.6 " x 1.5 "	12.8 " x 9.8 " x 2.2/7.3 "	14.5 " x 10 " x 8.4 "	2.6 " x 5 " x 1.25 "
Ruggedness	Impact-resistant ABS plastic	Aluminum case	Impact-resistant ABS plastic, nonslip rubber casing, splash resistance	Rubber bumpers to guard against impact/scratches	Impact-resistant ABS case, vibration and shock compliant to IEC 68-29Eb,6Fc,64Fh,27Ea	Impact-resistant ABS case, vibration and shock compliant to IEC 68-29Eb,6Fc,64Fh,27Ea
Accessories and/or Equipment Options	Barometer, GPS, docking station, keyboard, smartcard reader, printer with magnetic card reader or 2D bar code scanner, carrying case	Barometer, dry gas pressure sensor, dry gas carrier, 2D barcode reader, magnetic strip reader, smart card reader	GPS, mouth alcohol detection, magnetic card reader, charging cradle, holster set	Handle, USB keyboard, external printer, optical and magnetic card reader, carrying case, mounting adapter, organizer stand with keyboard drawer.	External printer, internal modem, magnetic strip reader, barcode reader, carrying strap	Barometer, GPS receiver, custom sequence software, protective grip, wrist straps, wireless keyboard, magnetic grips, carrying cases,

CMI, Inc.

CMI, Inc. has been developing Intoxilyzer breath alcohol testing instrumentation for more than 30 years. The company, located in Owensboro, KY, serves a wide range of clients including law enforcement, corrections, workplaces, schools, military, and medical facilities. CMI, Inc. produces two types of instruments: handheld devices, which use fuel cell technology to detect breath alcohol levels, and both mobile and stationary devices, which use IR technology to detect breath alcohol levels. Best sellers include the handheld Intoxilyzer 500 and the Intoxilyzer 8000, which may be used in a stationary or mobile setting. The latest addition to the breath testing line, the Intoxilyzer 9000, has passed all required testing by the U.S. Department of Transportation and also may be used in a stationary or mobile setting. The company offers a 1-year warranty on the Intoxilyzer 8000 and 9000 and a 2-year warranty on the Intoxilyzer 500. In addition to the breath alcohol devices, CMI, Inc. sells a wide range of supplies and accessories for these instruments, disposable mouthpieces, printers, printer paper, storage cases, calibration materials, and data management software. CMI, Inc. prides itself on its high-quality training programs, having trained over 30,000 students for instrument use in law enforcement or workplace testing. The company holds training courses at their Owensboro, KY, facility and at other locations throughout the world.

Unique Features :

- The Intoxilyzer 9000 model analyzes samples at four different wavelengths, which offers high specificity to ethanol.
- The Intoxilyzer 9000 uses a digitally controlled pulsed IR source, rather than the older mechanical chopper technology, which is prone to malfunction and wear.
- The Intoxilyzer 9000 offers a user-friendly touch-screen interface.

Dräger Safety Diagnostics, Inc.

Dräger is a German-based company that engineers devices in the medical and safety fields. It has over 60 years of breath alcohol analysis experience. In the U.S., the company's drug and alcohol detection solutions are represented by Dräger Safety Diagnostics, Inc. (DSDI).

Dräger Safety Diagnostics, Inc. is dedicated to advancing traffic safety by supporting law enforcement, criminal justice, and workplace safety professionals. To help achieve this goal, the company offers a complete portfolio of innovative solutions, including preliminary and evidential breath alcohol testing, oral fluid drug-screening systems, and breath alcohol ignition interlock devices. Dräger offers handheld instruments that operate using fuel cell technology and transportable alcohol breath instruments that use both IR absorption and fuel cell technology. These devices are listed on NHTSA's federal conforming products list as evidential breath measurement devices. Two of the newest additions to Dräger's product line include the handheld Alcotest 7510 and the transportable Alcotest 9510. To supplement these handheld and transportable devices, Dräger offers a range of accessories including data loggers, mobile printers, protective cases, card readers, and keyboards. Dräger offers custom, in-person, train-the-trainer, technician, and maintenance training and uses an online platform, Litmos, to supplement training for users to operate Alcotest devices.

Unique Features:

- Dräger's transportable unit, the Alcotest 9510, integrates two different detection methods, IR spectroscopy and fuel cell technology, to detect breath alcohol concentrations.
- The handheld breath alcohol device, the Alcotest 7510, is capable of measuring mouth alcohol through a unique, piezoelectric-activated sampling system.
- The Alcotest 9510 has a high-resolution color touch screen.

Intoximeters, Inc.

Intoximeters, Inc. is based in St. Louis, MO. The company’s founder, Dr. Glenn C. Forrester, patented a process for breath alcohol testing in 1937. Over the years, Intoximeters, Inc. has employed a number of analytical technologies in their alcohol testing instruments, including gas chromatography and IR analysis, with the company ultimately discovering the advantages of using electrochemical fuel cells. This led the company to concentrate its efforts on developing evidential-grade fuel cell instruments.

Intoximeters, Inc. offers a full line of electrochemical, fuel cell–based evidential handheld and desktop breath alcohol testing instruments. Its desktop instruments include both fuel cell– and IR technology–based options. Top-selling, portable evidential instruments for Intoximeters, Inc. include the handheld Alco-Sensor IV and Alco-Sensor VXL models and the transportable Intox EC/IR II.t. To supplement its breath alcohol testing instruments, the company offers supplies and accessories such as printers, docking stations, data cables, magnetic card readers, and software. To help ensure the integrity of clients’ breath testing programs, Intoximeters, Inc. provides dry gas standards produced by an ISO 17025– and Guide 34–accredited supplier. Standards are directly traceable to reference gas materials certified by the National Institute of Standards and Technology (NIST). Clients can receive a certificate of analysis and view their dry gas standard’s traceable path through Intoximeters, Inc.’s online resource called True-Trace™.

The Intox Training Academy provides training courses, classroom and online, for workplace and law enforcement breath alcohol testing. Intoximeters, Inc.’s training modules exceed the guidelines set by the DOT.

Unique Features:

- The transportable Intox EC/IR II.t uses dual-detection technologies, measuring breath alcohol concentration with an electrochemical fuel cell and qualifying the sample with IR spectrometry. The unique IR portion of the system monitors both alcohol and carbon dioxide concentrations in the breath, allowing for increased detection sensitivity to the potential influence of mouth alcohol.
- The handheld Alco-Sensor VXL has operator safety features, including a patented, rear-facing display that allows the operator to remain in control of the subject and monitor the surrounding environment. The unique lever-and-snap mouthpiece directs the subject’s breath away from the officer.

Lifeloc Technologies, Inc.

Lifeloc Technologies, Inc. is a Colorado-based company that has over 30 years of experience providing both drug and alcohol testing equipment for applications in law enforcement, the workplace, corrections, schools, oil and gas, military, chiropractic, and personal use. The company markets the FC20, a handheld, fuel-based breath alcohol detection instrument that has been approved by NHTSA and placed on the federal conforming products list of evidential breath alcohol devices. It has a 1-year parts and labor warranty, in addition to a lifetime fuel cell warranty. The company offers a variety of kit configurations for these products and accessories such as wireless keyboards, thermal printers, and cases. The company also provides the EASYCAL calibration system and AlcoMark, breath testing management software that stores calibration and breath test data. Lifeloc Technologies, Inc. offers training sessions on site as well as in its factory in Denver and online.

Unique Features:

- The FC2OBT device is capable of wireless and encrypted Bluetooth printing.
- The EASYCAL calibration station automates and simplifies the process of external handheld device calibration and accuracy checks.
- Compatible with EASYCAL Automatic Calibration Station

SUMMARY

The goal of this report is to provide the reader with a basic understanding of mobile evidential breath alcohol instruments, as well as their use, benefits, and limitations. The information contained herein is derived from current literature and interviews with both users and technology developers, providing a thorough assessment of the considerations that will impact procurement, training, fielding, and use of mobile evidential breath alcohol instruments. This report also provides suggested methodologies for incorporating a mobile breath alcohol instrument workflow to help establish best practices for investigating alcohol-related driving incidents.

As technology used to determine BrAC has matured, the options available for use in law enforcement have increased. Refinement of fuel cell and microprocessor technology has enabled the development and commercialization of handheld instruments that provide reliable and accurate BrAC measurements. Similarly, advancements in IR spectrometry have enabled the development of instruments that are smaller, lighter, more rugged, and thus easily transportable in the field. Despite these technological advancements, challenges associated with regulating instrument use at the state and local levels remain. Although not required to do so, most agencies use the CPL as a resource for selecting instruments that fit their specific needs, implementing their own procedures for instrument procurement, training, use, and maintenance. This report emphasizes the need to follow these procedures accurately to prevent the evidence from being deemed inadmissible in a court of law.

The key benefits associated with mobile evidential breath instruments include the ability to immediately test a subject's breath alcohol concentration and the time saved in completing an investigation. Testing breath alcohol at the point of detention provides the most accurate indicator of a subject's true intoxication level, because the time involved in transporting a subject back to the station for testing may result in a lower breath alcohol concentration than what would have otherwise been obtained in the field. Test results that are within the legal limit allow the officer to continue fieldwork, and handheld and transportable models now incorporate technology that enable paperwork to be completed more efficiently. All these factors enable the officer to spend more time policing in the community.

Key lessons learned from user experiences highlight challenges associated with mobile instrument adoption, technology features, and quality control. Laws and regulations are state- and county-dependent, which makes for highly variable standards across the country. OSAC's Toxicology Committee is leading efforts to standardize specifications, validations, calibrations, and testing methodologies across the U.S. Handheld breath alcohol instruments are a viable technological alternative to transportable and stationary models. They are less expensive to purchase and are often easier to operate; however, they offer fewer features (no internal standard and less sophisticated diagnostic tools) and require more frequent calibration checks and maintenance. Ultimately, the decision to choose handheld or transportable breath alcohol instruments is a matter of what is most convenient for the respective agency.

Broader adoption of mobile evidential breath alcohol instruments should result from a better understanding of the key benefits, challenges, and lessons learned from other agencies' experiences. Representatives from multiple agencies mentioned observing other trailblazer states and localities that used handheld and transportable evidential units before implementing the devices themselves. The FTCoE hopes that the information provided in this report will help agencies make an informed decision regarding the incorporation of mobile evidential breath alcohol instruments into their programs.

ADDITIONAL RESOURCES

For practitioners considering incorporating mobile evidential breath alcohol instruments into their breath alcohol programs, resources are available to assist with adoption and implementation. Multiple organizations and associations monitor the improvements in this technology, and document the admittance and use of breath alcohol instruments data in court proceedings. This information may be maintained in databases of case law from various jurisdictions and judicial districts. In addition, many of these same organizations serve as a clearinghouse for training opportunities, sharing of policies and procedures, and standardization of the technology throughout the field.

To learn more about transportable breath alcohol instruments, consider the following resources. Please note that some sources have been previously referred to in the body of this landscape report.

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