WWW.DADSS.ORG

Driver Alcohol Detection System for Safety (DADSS)

Using Technology to Eliminate Drunk Driving

Hyundai Research Meeting with NHTSA
April, 2010

Why do we need a technological solution?

NHTSA, 2003

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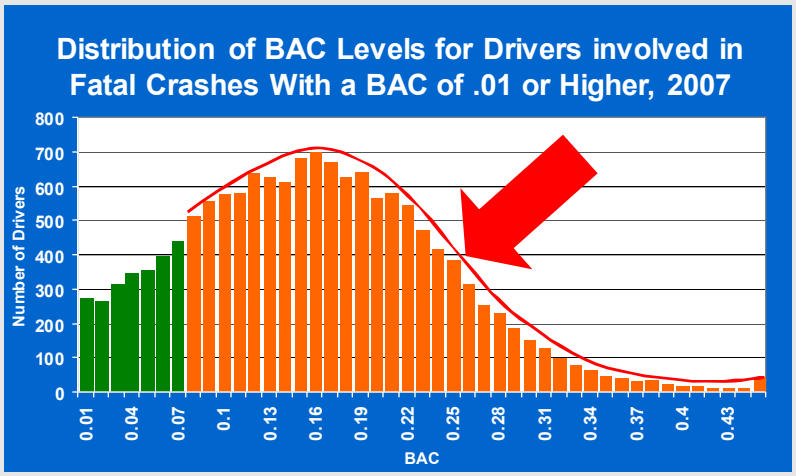
Why do we need a technological solution?



NHTSA, 2008

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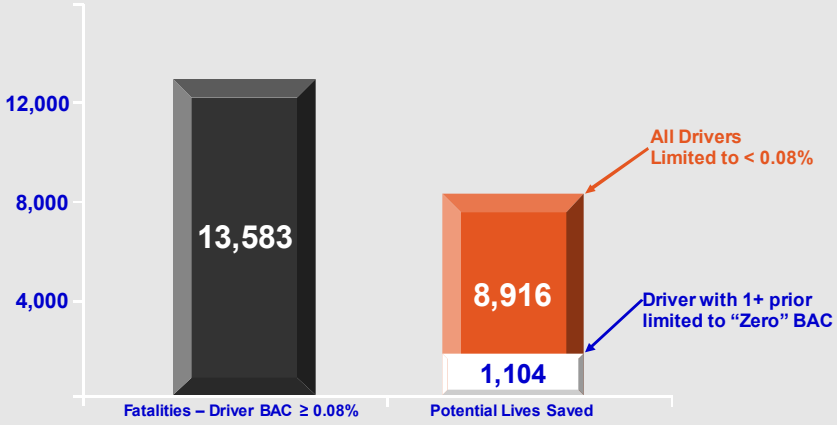
Potential Safety Benefits

- Potential lives saved in the U.S. in 2005 if vehicle technologies limited driver BAC to specified levels



IIHS, 2007

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Current Technology – Breath Alcohol Ignition Interlocks

- Drivers provide a breath sample before starting the vehicle
- **Lengthy time** for measurement
  - breath alcohol measurement can take from about 30 seconds to several minutes in colder temperatures
- **Too intrusive** for more widespread use among general public

DADSS Goal and Process

- **Five-year, cooperative program between NHTSA and Industry (through ACTS, the Automotive Coalition for Traffic Safety)** to develop and test prototypes that may be considered for vehicle integration thereafter
- End Goal: A **non-invasive, seamless technology to measure driver BAC** and reduce the incidence of drunk driving
  - Development undertaken as a step-by-step, data-driven process to ensure that effective technologies are developed
  - Intended to support a non-regulatory, market-based approach to preventing drunk driving

DADSS Blue Ribbon Panel

- **BRP appointed by ACTS** and works in an advisory capacity
- **Comprised of experts** from various disciplines, including
  - Auto manufacturers
  - Suppliers
  - Alcohol toxicology
  - Impairment
  - Ignition interlocks
  - human factors
  - Research scientists
  - MADD
  - IIHS
  - NHTSA
  - Foreign governments
- BRP assigned **three working groups** to assist in effort:
  - DADSS **Program Management Plan**
  - DADSS **Performance Specifications**
  - DADSS **Public Acceptance and Public Policy**

Criteria for acceptable widespread use

Minimum requirements:

- **Non invasive**
- **Quick** to use
  - Determine BAC in less than 0.5 seconds from activation and recycle
- **High accuracy**
- **Small**
- **High reliablility**
- **Repeatable**
- **Durable**, robust
- **Low cost**
- **No or low maintenance**
- **Virtually invisible** to sober drivers

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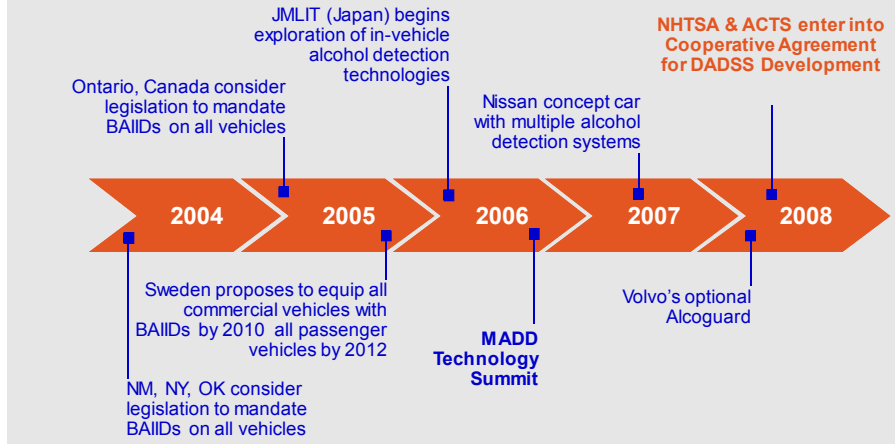
How We Got Here



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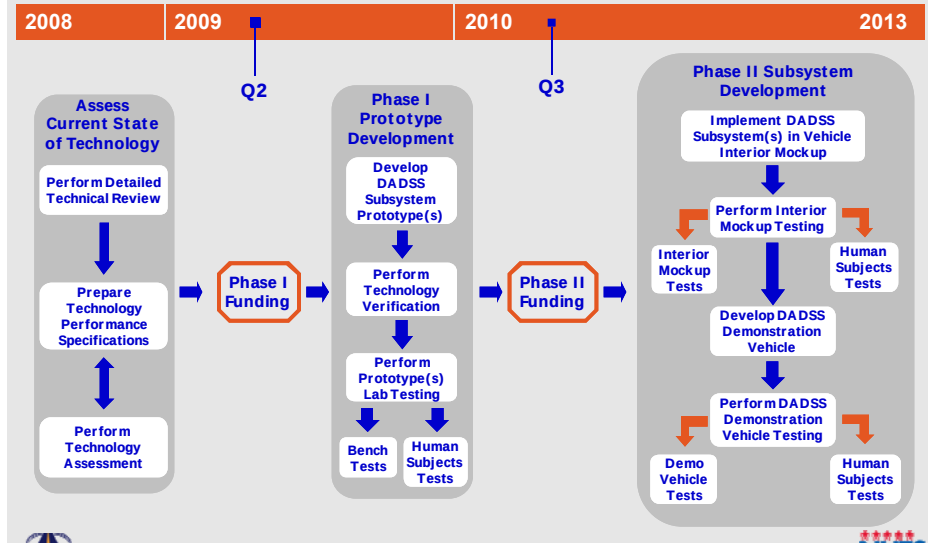
DADSS Program Process



Phase I: Contracts Awarded to Develop Prototypes

- **Three subcontracts** have been awarded to international companies
  - TruTouch Technology—USA
  - Alcohol Countermeasure Systems—Canada
  - Autoliv Development AB—Sweden
- 12-month period of performance (1st phase)
- **Prototypes to be received June-July, 2010**
  - Bench testing and human subjects testing to be performed June-August, 2010

Technology Types Being Developed

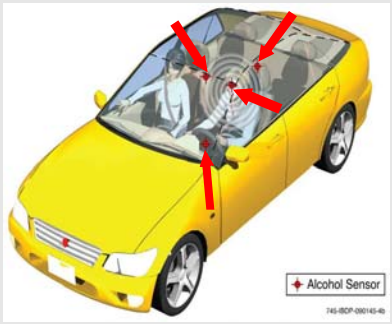
1. **Tissue Spectrometry**
   - TS subsystems allow estimation of BAC by **measuring how much light has been absorbed at particular wavelength from a beam of Near-Infrared (NIR) reflected from the subject skin**
   - **Touch-based systems** that require skin contact
2. **Distant Spectrometry**
   - **IR or laser light** is transmitted to the subject from a source that receives and analyses the reflected and absorbed spectrum, **to assess chemical content of tissue or liquid in vapor**
   - **No skin contact** is required

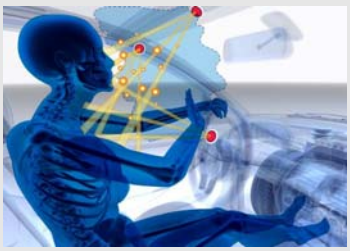
Tissue Spectrometry Systems

- Illustration shows **one potential adaptation** in a vehicle using a stop/start button

Distant Spectrometry

- Use unobtrusive "sniffer" to detect alcohol in the vehicle
  - Multiple sensors in-vehicle (steering wheel, A-Pillar, etc..)
- Approach is to **identify and quantify small variations of the air** constitution
  - alcohol concentration in exhaled breath
  - One approach determines BrAC of driver using carbon dioxide as correlant





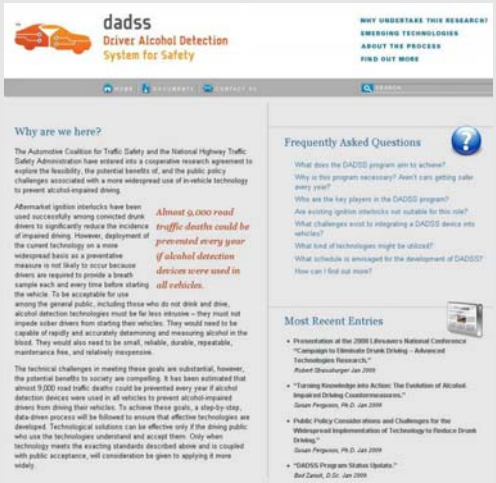
Electrochemical – Transdermal Approach not being pursued

- Measures alcohol in perspiration through contact with the skin
  - Currently used to continuously monitor alcohol offenders to ensure they're not drinking
- Lag time issues
  - Alcohol levels do not rise as quickly as BrAC and BAC
    - **A time delay on the order of 60 minutes**
  - Using existing transdermal sensors, alcohol begins to arrive at the skin surface in quantities the sensor can detect in approximately 30-45 minutes

Communicating with the Public

- A **website was launched** to provide public information:

www.dadss.org

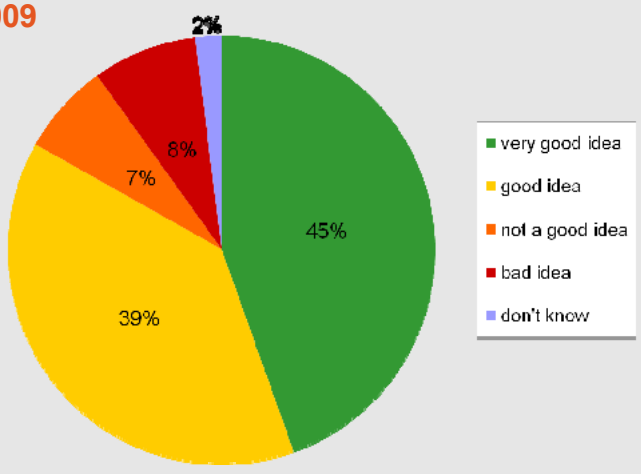


Acceptance among the public and key leaders is critical

- Technology **will be effective only if the driving public welcomes and accepts it:**
  - **58 percent of the U.S. public say they support smart technology to prevent driver impairment** including alcohol-impaired driving (MADD U.S survey, 2006)
  - **56 percent of the Canadian public agree that all new vehicles should be equipped with a device that can detect alcohol in the driver** and prevent starting if the driver is over a preset limit (MADD Canada survey, 2007)
  - **64 percent of the U.S. public say they support advanced technology in all vehicles, if its reliable, to prevent anyone with an illegal BAC from driving** their car (IIHS, 2009)
  - **78.6 percent of the U.S. public say they support all cars being equipped with devices that won't let the car start of the driver is drunk** (AAA Foundation, 2009).

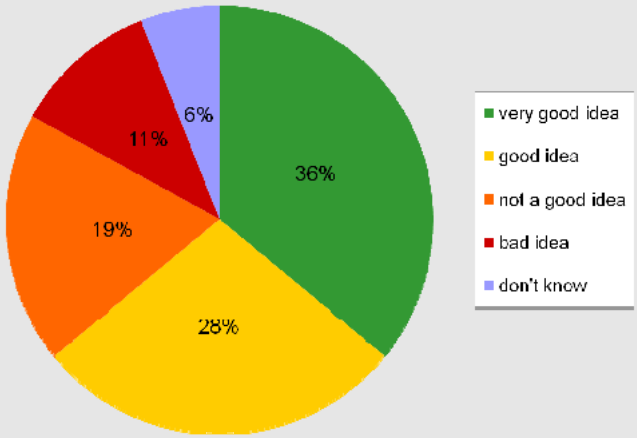
Attitudes toward requiring alcohol ignition interlocks for convicted DWI offenders

IIHS, July 2009



Attitudes toward advanced alcohol test technology in all vehicles, if technology shown to be reliable

IIHS, July 2009



The Challenges

- Developing a **reliable and seamless technology that fulfills all the specifications necessary** for use in a vehicle environment
  - Has to work **each and every time**, over the **life of the vehicle**, and in a **variety of challenging environments**
- Anticipating and **addressing likely circumvention strategies** by drivers
  - Some drivers are highly motivated to "beat" the system
  - Needs to be addressed as part of the system design
- **Unintended consequences**
  - Are there ways in which longer term driver behavior could be affected that would negatively impact safety in the future?

Next steps

- **Test and evaluate Phase I prototypes**, June-August 2010
- **Phase II Request for Proposals**, September 2010
- **Develop demonstration vehicles** January 2011-November 2013
- **Demonstration vehicle bench and human subjects tests**, November – December 2011

QUESTIONS?

http://www.dadss.org

CONTACT INFORMATION:

Susan Ferguson, Program Manager
sferguson@dadss.org

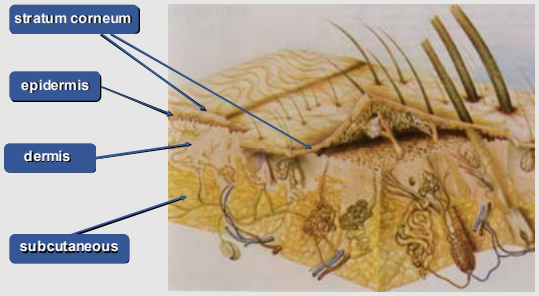
Eric Traube, NHTSA
eric.traube@dot.gov

Tissue Spectrometry
Contractor - TruTouch Technologies

Spectroscopy in Tissue

Stratum Corneum & Epidermis – thin protective layer, minimal water content → *minimal alcohol*

Subcutaneous – deeper layer, mostly lipids (fat), minimal water → *minimal alcohol*



Dermis – comprised largely of collagen and water (interstitial fluid), nutrients supplied by capillary bed (blood) → *ISF alcohol*

The dermis is the critical tissue layer to interrogate

TruTouch Technologies

Technology Description

- Previous device: User's forearm illuminated with NIR light
- A new, smaller prototype using a square touch pad has been successfully evaluated and demonstrated
  - Provides 6 times improvement in optical signal-to-noise
  - Reduced measurement time
  - Conducive to BAC measurements using the hand
- Proposed technology is based on miniaturizing the Table-Top square optical touch pad device to meet DADSS requirements
- Evaluated other locations on the hand for vehicle application