Home Smoke Alarm Research

Recent Developments

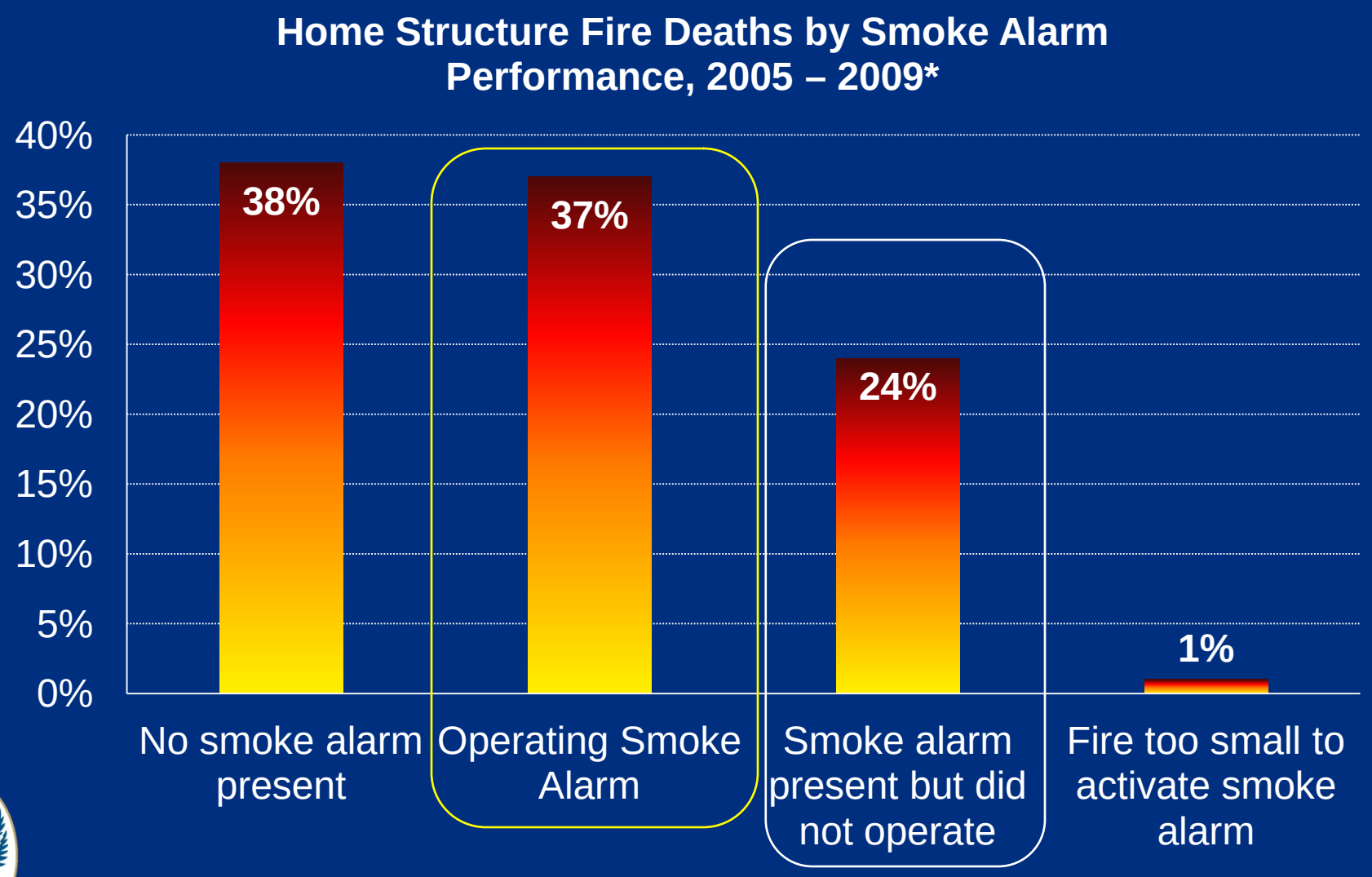
December 5, 2012

U.S. Fire Administration | FEMA

United States Consumer Product Safety Commission

Oak Ridge National Laboratory

Motivation



* Ahrens, Marty, "*Smoke Alarms in U.S. Home Fires*," NFPA, Quincy, MA 02169-7471, September 2011.

Project Goals

- Functional – earlier alarm than existing products. ✔
  – improved awakening performance. ✔
- Reliability – improved resistance to nuisance alarms. ✔
- Power – capable of battery operation. ✔
- Cost – mass-produced product < $30 per unit. ✔
- Size – production unit should have a form factor similar to current products. ✔
- Durability – extended service life. ✔

Findings

- More data can yield better decisions!
  - more sensors
  - time dependent rate of change
- CO sensor – smoldering fires and CO poisoning.
- Upgrade Photoelectric sensing
  - blue LED, dual λ or dual angle.
- Microcontroller based decision making
  - LDA
- Alert Tone can be improved.
- On horizon: NDIR sensors – CO_2, H_2O, CO & HCs.

Commercial Developments

- **Promotional video**
  - *http://www.youtube.com/watch?v=mOjtxqBeL8A&feature=em-subs_digest*
- **USI**
- **Kidde**
  - **Intelligent Alarm**
  - **Worry-Free Series**

USI Iophic Alarm

- Ionization with microprocessor
- Fixed threshold
- Dynamic thresholds
- Manufacturer recommends placement as close as 7 ft. to stove.
- Limited in-situ testing 6 ft. from cook top showed typical sensitivity to steam and cooking vapors.

Kidde Intelligent Alarm

- Ionization & CO with microprocessor.
- Provides both CO and Fire alarms.
- The threshold sensitivity of the ionization sensor increased when significant CO (> 40 ppm) was present.
- Limited in-situ testing 6 ft. from cook top showed considerable improvement in nuisance alarm resistance to kitchen sources.

Kidde Worry-Free Line

- Photoelectric detectors with sealed 10-yr. battery.
  - CR2 battery
- Several options
  - Living Area
  - Hallway alarm w/ LEDs
  - Bedroom alarm w/ Voice
  - Kitchen alarm w/ Photoelectric & CO