Work to Zero: 
Eliminating Death on the Job through Emerging Technology

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IN OUR LIFETIME, ELIMINATING PREVENTABLE DEATHS
OUR PRIORITIES CUT ACROSS ALL AREAS OF EVERYDAY LIFE

- AT WORK
- HOME & IN THE COMMUNITY
- ON THE ROAD

- Total Deaths
- Unintentional Deaths
- Unintentional Death Rate (per 100,000 workers)
- OSHA Recordable Rate (per 100 workers)
How Do We Break Through the Plateau?

WORK TO ZERO

Eliminating death on the job through emerging technology
Breaking Through the Plateau

What does the data tell us?
Number of preventable fatal work injuries by industry sector, 2016-2017

- Construction
- Transportation and warehousing
- Agriculture
- Professional and business services
- Government
- Manufacturing
- Leisure and hospitality
- Retail trade
- Wholesale trade
- Other services
- Educational and health services
- Mining
- Financial activities
- Information
- Utilities
Challenge #1: Data Quality & Insight

DEAR ISAAC

DO YOU LIKE ME?

☐ YES
☐ NO

there is as yet insufficient data for a meaningful answer
Breaking Through the Plateau

What does EHS science & research tell us?
The New Safety Triangle for SIF Prevention

Heinrich’s Safety Triangle

- 300 Non-Injury Accidents
- 29 Minor Injuries
- 1 Major Injury

The New SIF Prevention Model

- Incidents with SIF potential
- Precursors
- Recordable Injuries
- Lost Time Injuries
- Fatalities
Hierarchy of Controls

Safety depends *least* on employee behavior

Safety depends *most* on employee behavior
Challenge #2: Complex Implementations

Investigate
Implement
Analyze
Test
Business Process
Develop
Design
Identify
Challenge #3: “Shiny Object” Syndrome

INDUSTRY 1.0
Mechanization, steam power, weaving loom

INDUSTRY 2.0
Mass production, assembly line, electrical energy

INDUSTRY 3.0
Automation, computers and electronics

INDUSTRY 4.0
Cyber Physical Systems, internet of things, networks
Breaking Through the Plateau

Toward a Solution
Hazardous Situations – Situational and Systemic Factors

**Situational**
- Fall
- Crushed
- Amputation
- Electrocution
- Head Injury

**Systemic**
- Equipment or work design
- Training
- Communication
- Culture/competing priorities
- Fatigue
Hazardous Situations – Situational & Systemic Solutions

**Situational**
- Elimination
  - Automate task (robot)
- Substitution
  - Replace worker (UAV/drone inspection)
- Engineering
  - Interlock system (bluetooth/sensor wearable harness)

**Systemic**
- Administrative
  - More effective training (VR/immersive)
- PPE
  - Real-time information/expertise (Smart PPE/AR)
- Data/trending
  - Understanding risk/exposure (AI/machine learning)
Work to Zero Research Approach

- Data & Literature Review/Validation
  - NSC Injury Facts
  - BLS data – approximated to situation bass
  - Broad sweep of existing research

- Interview 40+ EHS professionals
  - Summarize top hazardous situations
  - Identify situational and systemic contributing factors
  - Summarize current EHS technology use and planned implementation

- Connect EHS technology to contributing factors
  - Summarize top 100 available EHS technologies
  - Map safety tech to SIF contributing factors
  - Provide technology solution recommendations

Hazardous Situation: Operating Machinery

- VR Safety Training
- Fatigue Monitors
- Systemic causes
- Bad Equipment Design
- Insufficient Training
- LMS & Training Tracking

30 fatalities
1% of fatalities

Safety Technology Applicability Assessment
Automatic shutdown of equipment when contact with a worker is detected has a high potential impact on preventing fatalities. Wearing the correct PPE at all times will also prevent fatalities and serious injuries. VR safety training specific to that equipment enhances training and BBS. Fatigue monitors will prevent employees using equipment who are not in a fit state to do so. Computer vision can be used to prevent workers entering areas with machinery when they are not wearing the correct PPE. LMS and training tracking can ensure workers are all trained to use machinery safely.
Work to Zero Research - Initial Results

- Top hazardous situations (% mentioned)
  - Work at height (70%)
  - Electrical work (70%)
  - Confined space entry (60%)
  - Heavy equipment operation (40%)

- Top currently used EHS technology (% mentioned)
  - Robots (e.g., UAVs) (60%)
  - Sensors/detectors (e.g., telematics) (40%)
  - Software (e.g., risk management) (40%)
  - Wearables (e.g., heart rate monitors) (30%)

- EHS tech most important criteria
  - Effective, relevant to top hazards, and easy for workers to use
What Comes Next?

Advisory Council → Research Report → Summit Event

Effectiveness Studies → Tools, Guidebooks, App → Iterative Research
A Final Challenge (and Opportunity): Convergence

Technology convergence is coming – but when?

Until then, must determine most effective solutions
Questions?

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