Lighting &Safety Innovations being used by CTDOT Bureau of Highway Operations and Maintenance

EXECUTIVE SUMMARY

This summary report presents the following 11 strategic objectives targeting national work zone safety-related issues:

1. Minimize driver behaviors that contribute to work zone crashes.
2. Reduce worker struck-by incidents and work zone activity area intrusions.
3. Reduce commercial motor vehicle involvement in fatal and injury work zone crashes.
4. Expand the availability of useful data-driven analyses and management processes to enhance work zone safety.
5. Improve safety and accommodation of other vulnerable road users (i.e., pedestrians, cyclists, and persons on other personal conveyances) through and around work zones.
6. Expand the availability, accuracy, and use of work zone event data.
7. Identify, evaluate, and implement cost-effective safety improvements to temporary traffic control.
8. Improve accommodation of traffic incident management needs in work zones.
9. Improve accommodation of motorcyclists through and around work zones.
10. Improve connected and autonomous vehicle abilities to more safely approach and traverse (or avoid) work zones.
11. Incorporate work zone safety into strategic workforce development efforts.

The report identifies specific activities for each strategic objective and potential stakeholders who could help implement or have an interest in one or more activities listed. The activities under each objective are organized along the following major categories:

- Research.
- Collaboration.
- Guideline/policy related.
- Training.
- Outreach.
- Technology development.

However, not all objectives have activities in all categories. Overall, 72 potential activities are identified. The report also presents performance measures for each of the strategic objectives.

Identification of National Work Zone Safety Objectives and Activities: Summary Report

Publication No. FHWA-HOP-22-059 March 2023

U.S. Department of Transportation
Federal Highway Administration

CTDOT
Bureau of Highway Operations

2010 to Present

- Osha reports 16.8% of deaths due to being struck by objects
- 44,000 Work Zone Injuries
- 857 Work Zone Fatalities
- 46% Increase since 2010

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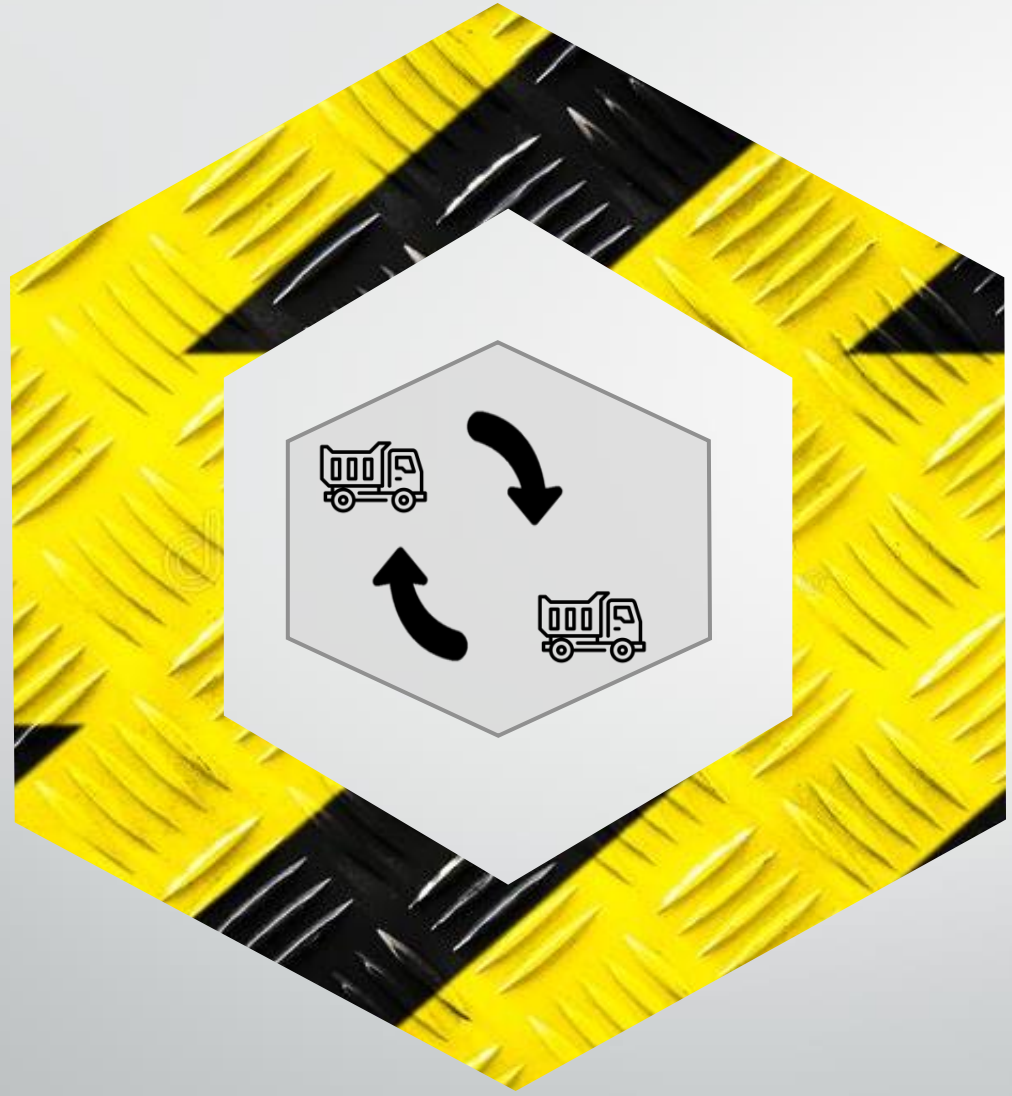
KEEP BACK
300 FEET
02-1162
45-11464
Let 'em Work
Let 'em Live

Warning Light Delete


KEEP BACK
300 FEET
02-1162
45-11464
Let 'em Work
Let 'em Live



Warning Light Synchronization

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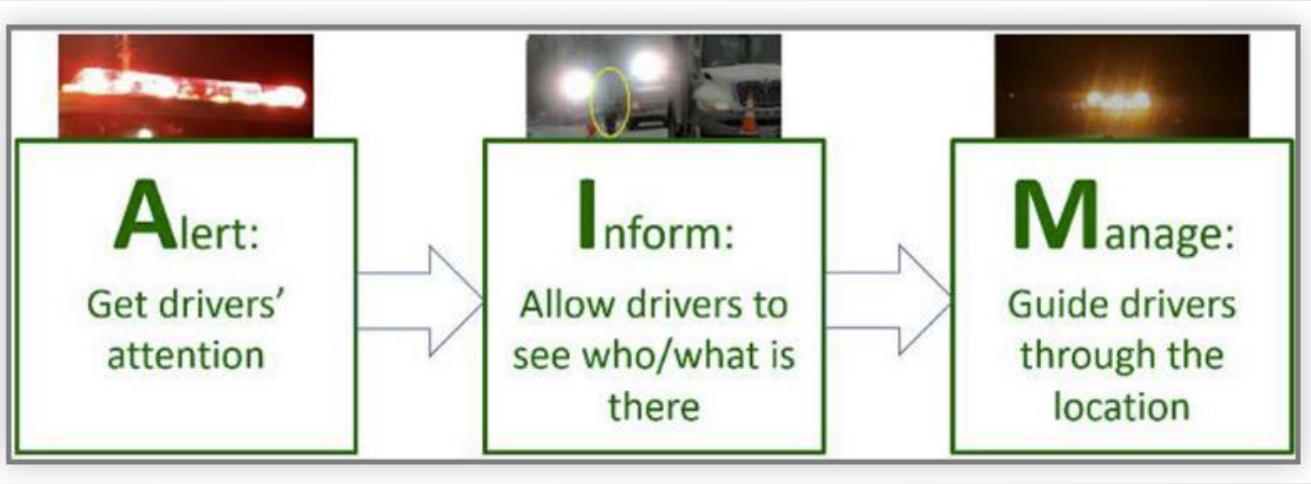
Warning Light Synchronization

WHY?



"Flashing emergency lights can potentially help manage drivers through or around emergency scenes by helping them confidently determine where they need to go. They are often deployed with uncoordinated flash cycles so that multiple lights flash in a random order with no particular sequence.

This contributes to a sense of visual chaos [11], whereas drivers reported that it was easier and more comfortable to drive through a work zone delineated with synchronized lights than one with randomly lashing lights [12]. It was even easier and even more comfortable to drive through a work zone with sequentially flashing lights."

SAE – Flashing Emergency Lights: Influence of Intensity, Flash Rate and Synchronization on Driver Visibility, Comfort and Confidence. March, 2022

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Warning Light Synchronization

Current Safety Standards

NFPA 1901 – Fire Apparatus
KKK 1822C – Ambulance

DOT and Road Side Construction - NO CURRENT STANDARD

-- Result = VISUAL CHAOS!

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Pi-Lits

- Rechargeable Sequential Electronic Flare
- Rapid deployment system
- Crush Proof up to 50,000 lbs
- Sequential Flashing Patterns
- Pi-Link to navigation apps

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Pi-Link

- Brings digital alerts to public mapping applications
- Fleet reports
- Automatic activation
- Portable

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HINVII Lights

- Highlights the Individual
- Non-Visible Light (Blacklight)
- Fills the gaps of flashing lights in the work zone
- Energizes safety apparel
- Serves Road Maintenance, Construction, Utilities, Public Safety Industries

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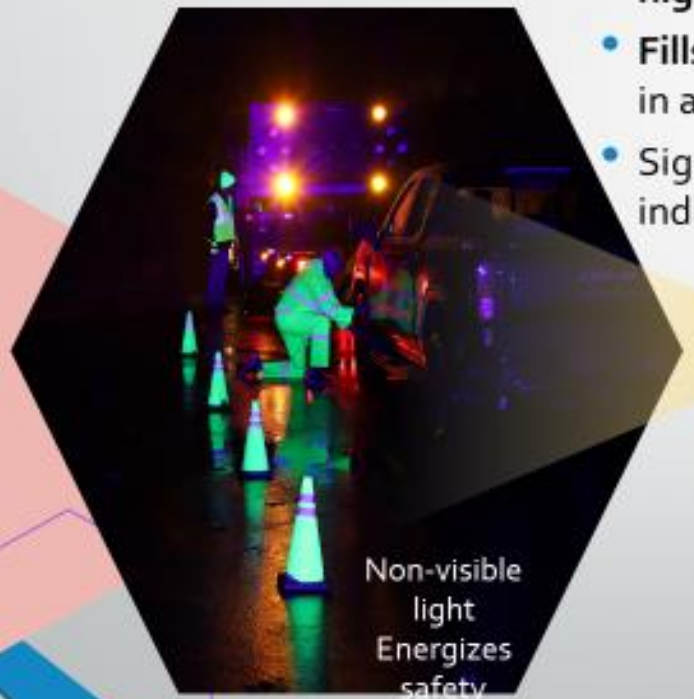
Night Safety

Highlighting the Individual

HINVII Technology

- This new implementation of non-visible light **reacts dramatically to high-viz clothing**
- **Fills the gaps** of flashing visible light in a work zone
- Significantly **boost visibility** of individuals



HINVII lights cycle between **amber light and non-visible light**

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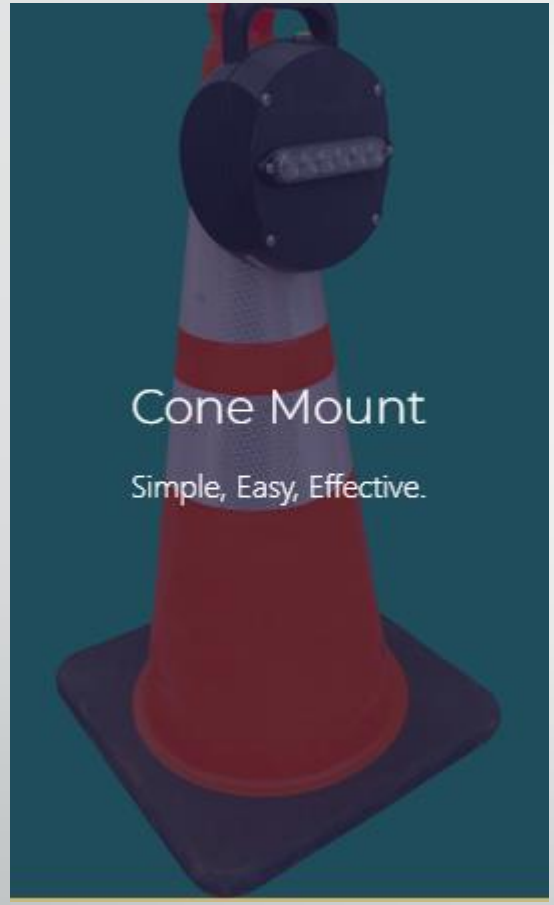
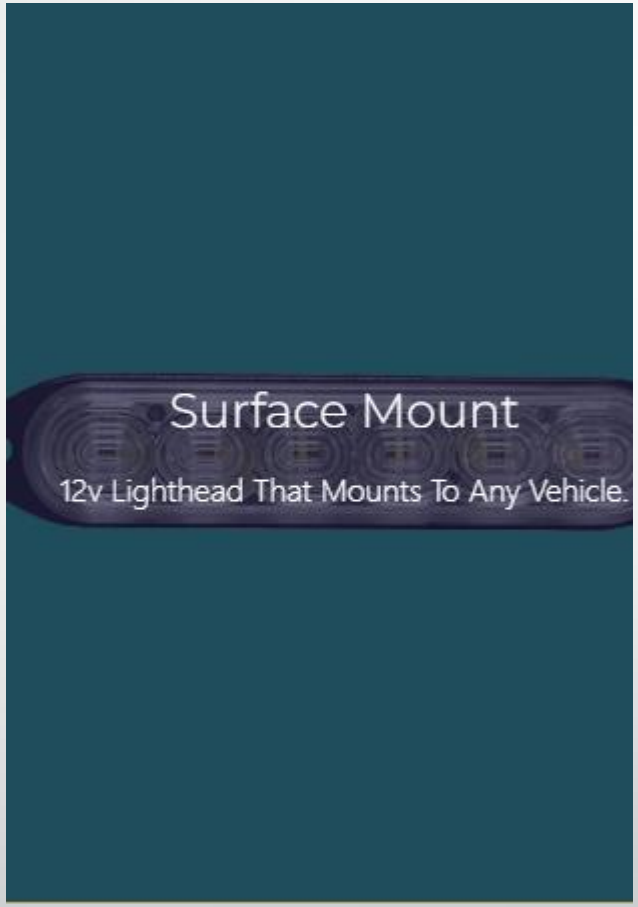
HINVII Lights





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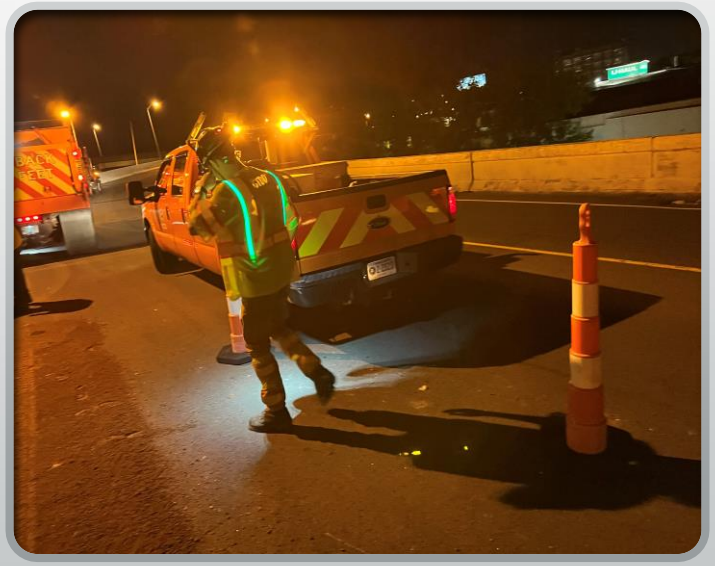
Night Light Safety Lighted Vests

- Fiber Optic Led Lights added to class 3 vests
- USB Rechargeable
- Visible from ½ mile in adverse weather
- Over 7,000 Hrs of use without replacement

Night Light Safety



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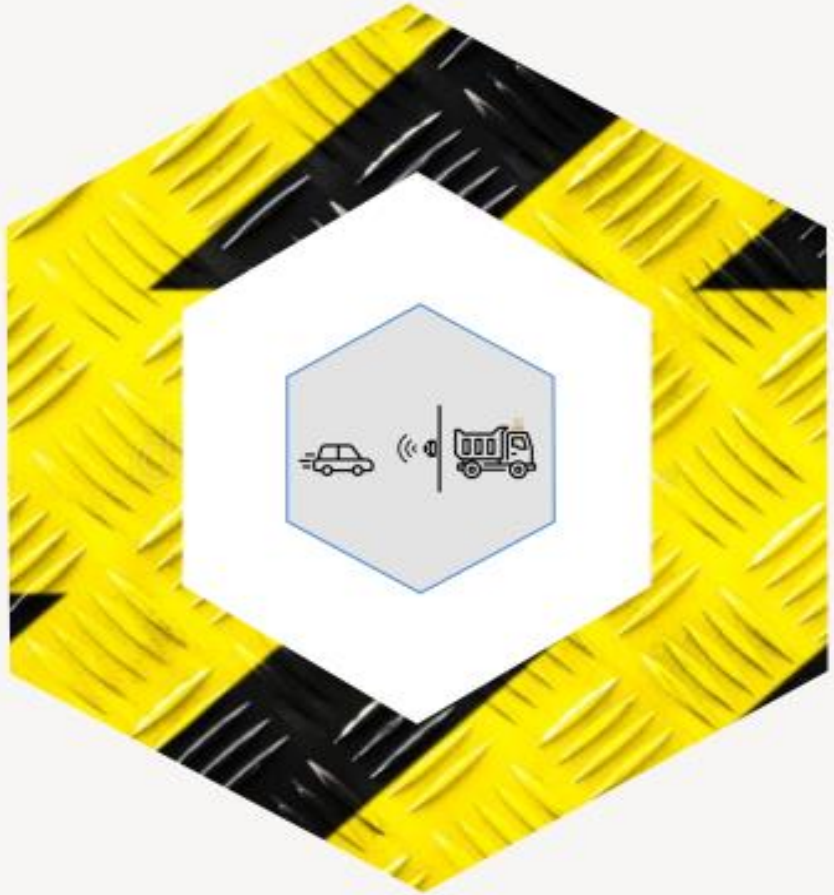

Intrusion Detection

Detecting Collisions Before They Happen

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Intrusion Detection

Rear End Collisions

- *42 percent* of *fatal* work zone crashes on rural interstates involve a rear-end collision.
- *ZoneCommand's* sophisticated Camera system alerts, both, oncoming drivers and workers in real time.
- Camera system has the ability to record and transmit data.

ZONE COMMAND

Field Testing:

Location: Rentschler Field , East Hartford CT

Results:
Ford Explorer – 60 yard consistent warning activation
Freightliner M2 – 100 yard consistent intrusion detection
Chevy 2500 – 100 yard consistent intrusion detection

Notes:
3 lane zone command. Ability to turn on or off in multiple lanes, up to 3.

System AI accurately made distinction from vehicle type and read an accurate speed of the vehicle.

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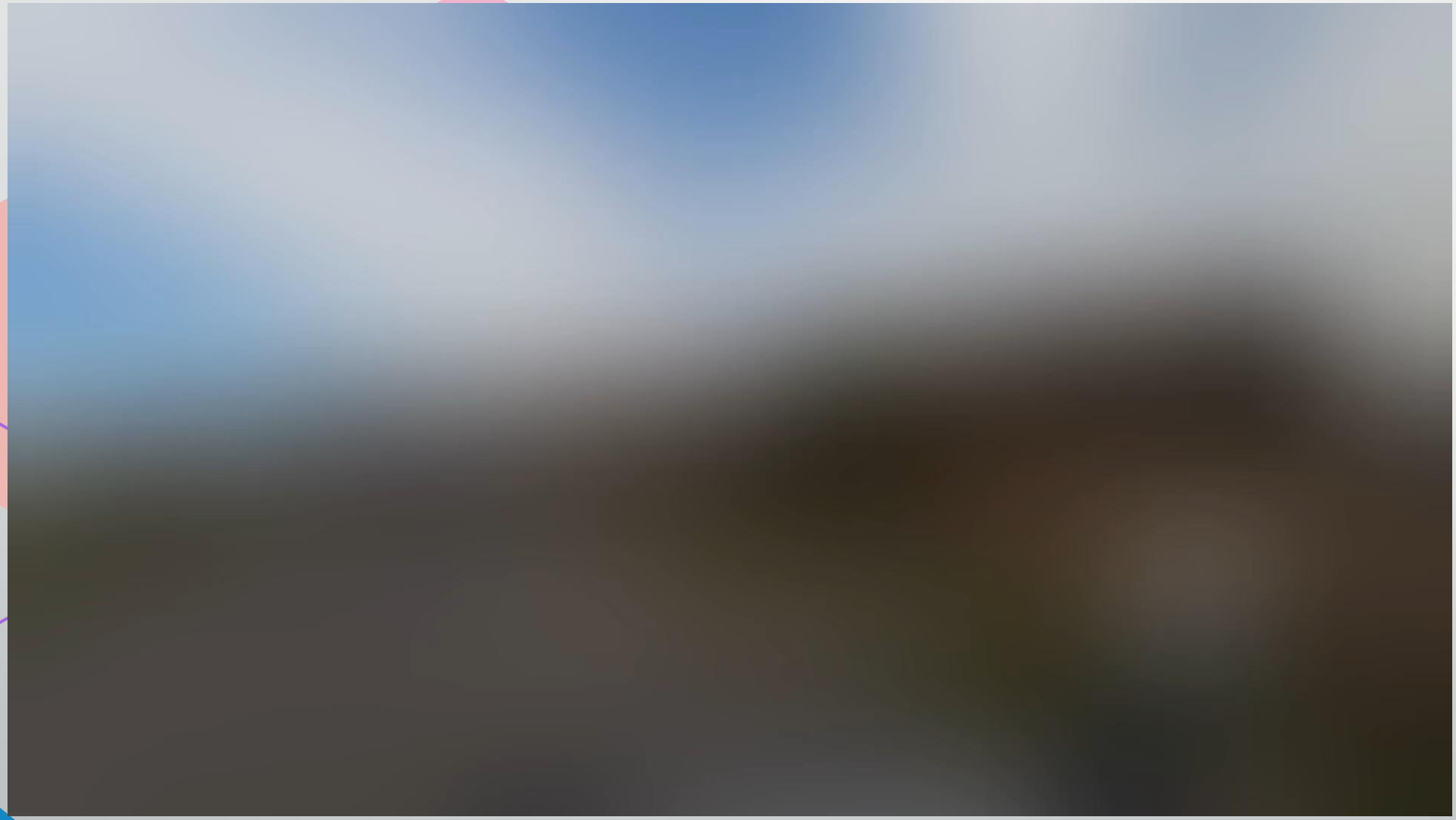
Zone Command system uses Artificial Intelligence to accurately identify approaching vehicles and warn both drivers and workers of potential collision

System captures valuable data in real time such as speed ,asset location and vehicle count .
The data can be used to study patterns and prevent future accidents,

ZoneCommand Demo




81

Test #1: Baseline – Speed Spy placed alongside the highway without a work zone or any speed reduction influences. This test provided a baseline of average daily vehicle speeds through this area.

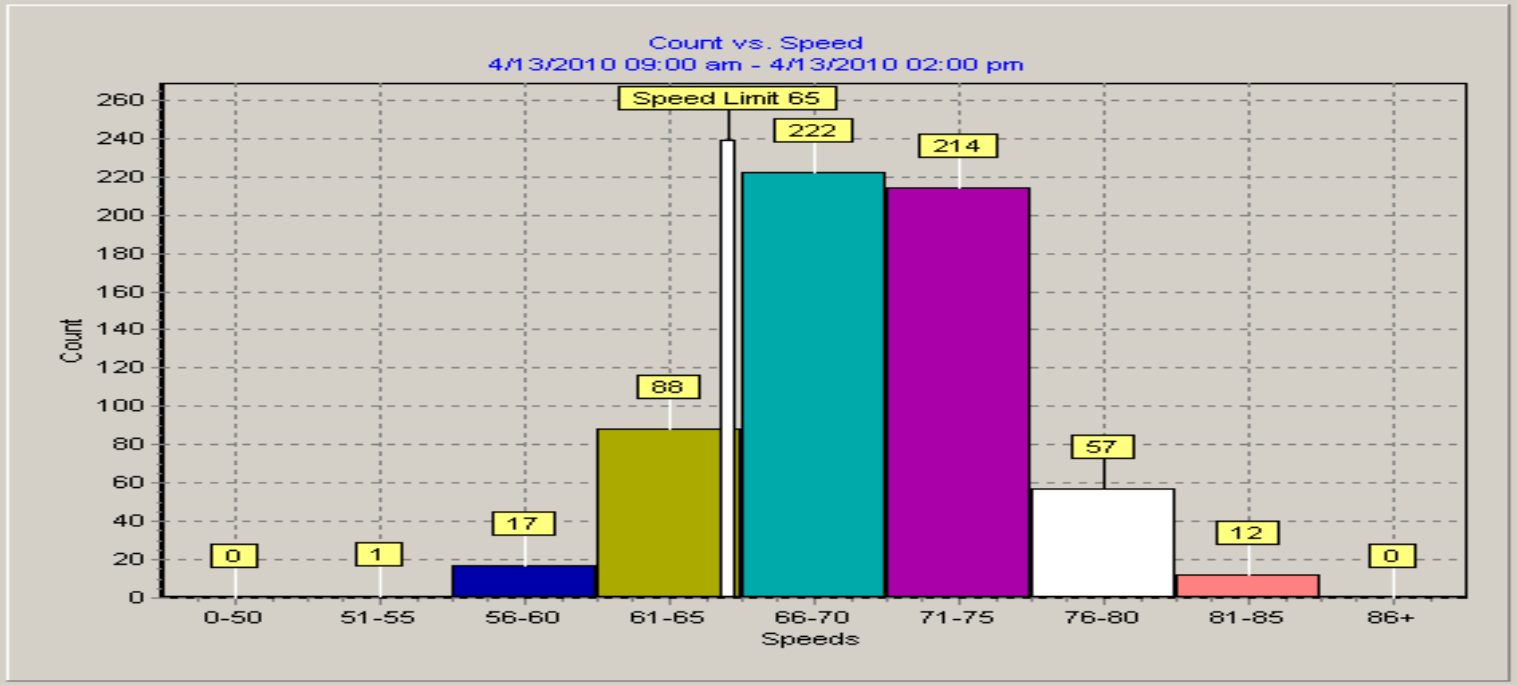
Summary: Average

Date:	4/19/2010 08:31:20 am
Start Date:	4/13/2010 09:00 am
End Date:	4/13/2010 02:00 pm
Time Interval:	60 minutes
Speed Interval:	5 mph
Posted Speed Limit:	65 mph
Average Speed:	70 mph
Highest Speed:	85 mph
50th Percentile:	70 mph
85th Percentile:	75 mph
Number Above Speed Limit:	505
Total Number of Vehicles:	611

Comments:

Test # 1 - Baseline

Conducted along CT Route 9 Northbound in the area between Exit 6 and Exit 7. All lanes of traffic are open. No work zone activity during this test.



Summary:

Average Speed : 70mph

Highest Speed: 85 mph

Vehicles Above 65mph Speed Limit: 82%

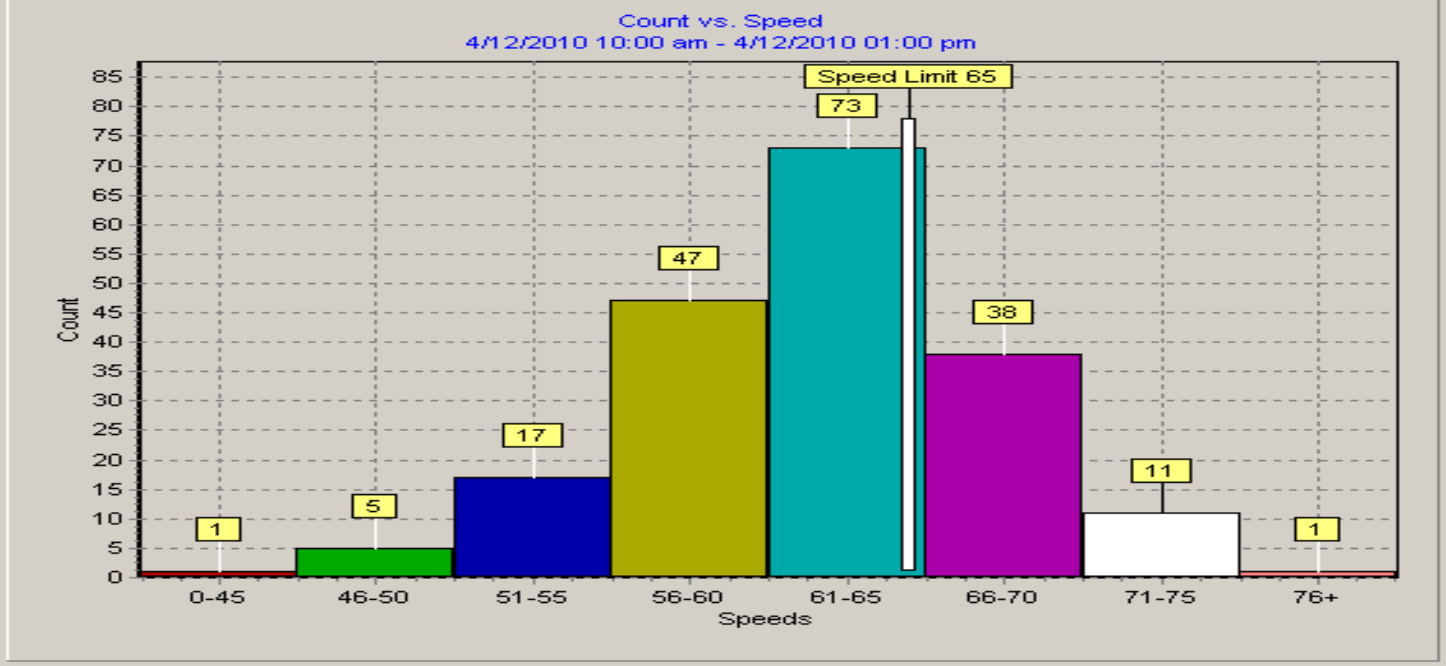
Test #2: Typical Workzone – The CT D.O.T. crew had a standard work zone in effect. The left or “high speed” lane was closed. Speed reduction influences in use at this time were: trucks with flashing arrows and lights, “Left Lane Closed” signage, “Fines Doubled” signage and a standard cone pattern.

Date:	4/19/2010 08:35:35 am
Start Date:	4/12/2010 10:00 am
End Date:	4/12/2010 01:00 pm
Time Interval:	60 minutes
Speed Interval:	5 mph
Posted Speed Limit:	65 mph
Average Speed:	62 mph
Highest Speed:	76 mph
50th Percentile:	63 mph
85th Percentile:	68 mph
Number Above Speed Limit:	50
Total Number of Vehicles:	193

Comments:

Test # 2 - Typical Workzone

Conducted along CT Route 9 Northbound in the area between Exit 6 and Exit 7. Left (high speed) lane closed. Speed reduction devices in use are standard workzone signage, flashing arrow trucks and a cone pattern. No other speed reduction devices in use.



Summary:

Average Speed : 62 mph

Highest Speed: 76 mph

Vehicles Above 65mph Speed Limit: 26%

Test #3: Speed Awareness – The CT D.O.T. crew had a standard work zone in effect. The same speed reduction influences in test # 2 were in place. In addition, the radar unit and 18” speed display panel were activated making motorists aware of their speeds as they passed through the work zone.

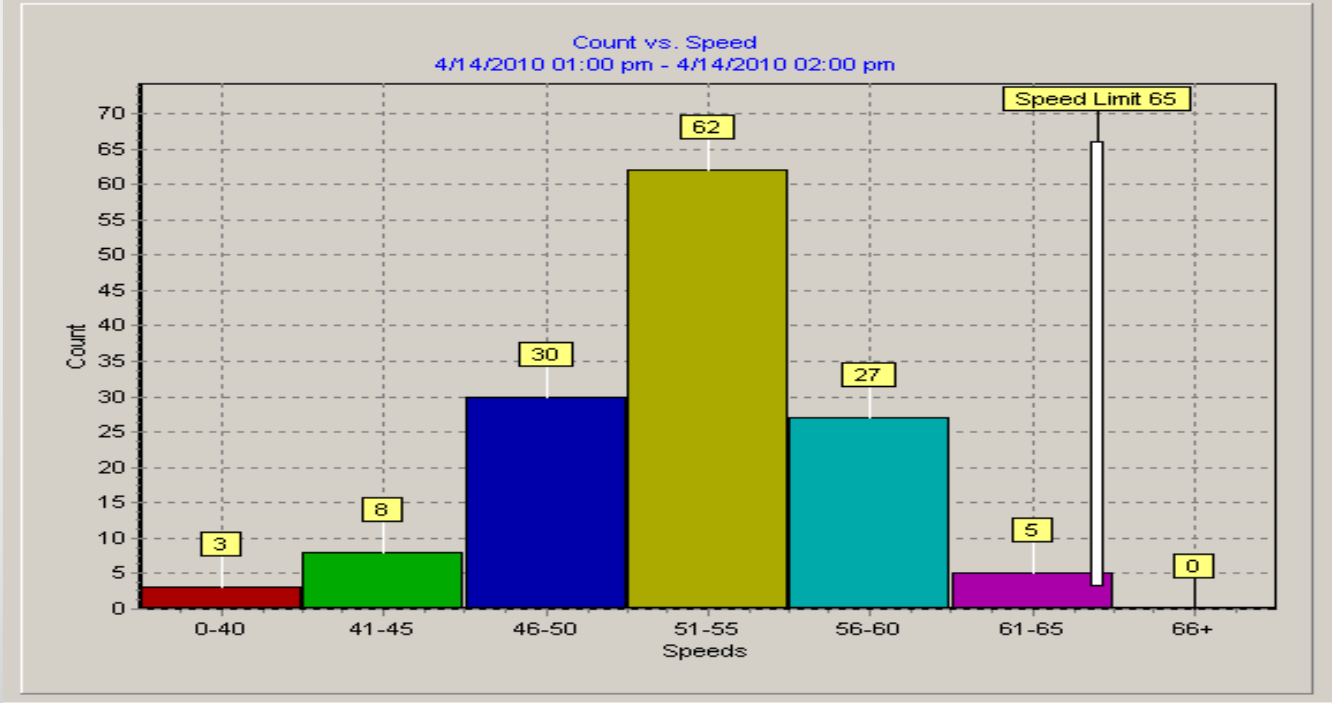
Summary:

Date:	4/19/2010 08:41:02 am
Start Date:	4/14/2010 01:00 pm
End Date:	4/14/2010 02:00 pm
Time Interval:	60 minutes
Speed Interval:	5 mph
Posted Speed Limit:	65 mph
Average Speed:	52 mph
Highest Speed:	63 mph
50th Percentile:	53 mph
85th Percentile:	57 mph
Number Above Speed Limit:	0
Total Number of Vehicles:	135

Comments:

Test #3 - Speed Awareness

Conducted along CT Route 9 Northbound in the area between Exit 6 and Exit 7. Left (high speed) lane closed. In addition to standard workzone vehicles and signage, appoaching vehicles are made aware of their speeds as they enter the work zone.



Summary:

Average Speed : 52 mph

Highest Speed: 63 mph

Vehicles Above 65mph

Speed Limit: 0%

TTMA Truck Upgrades

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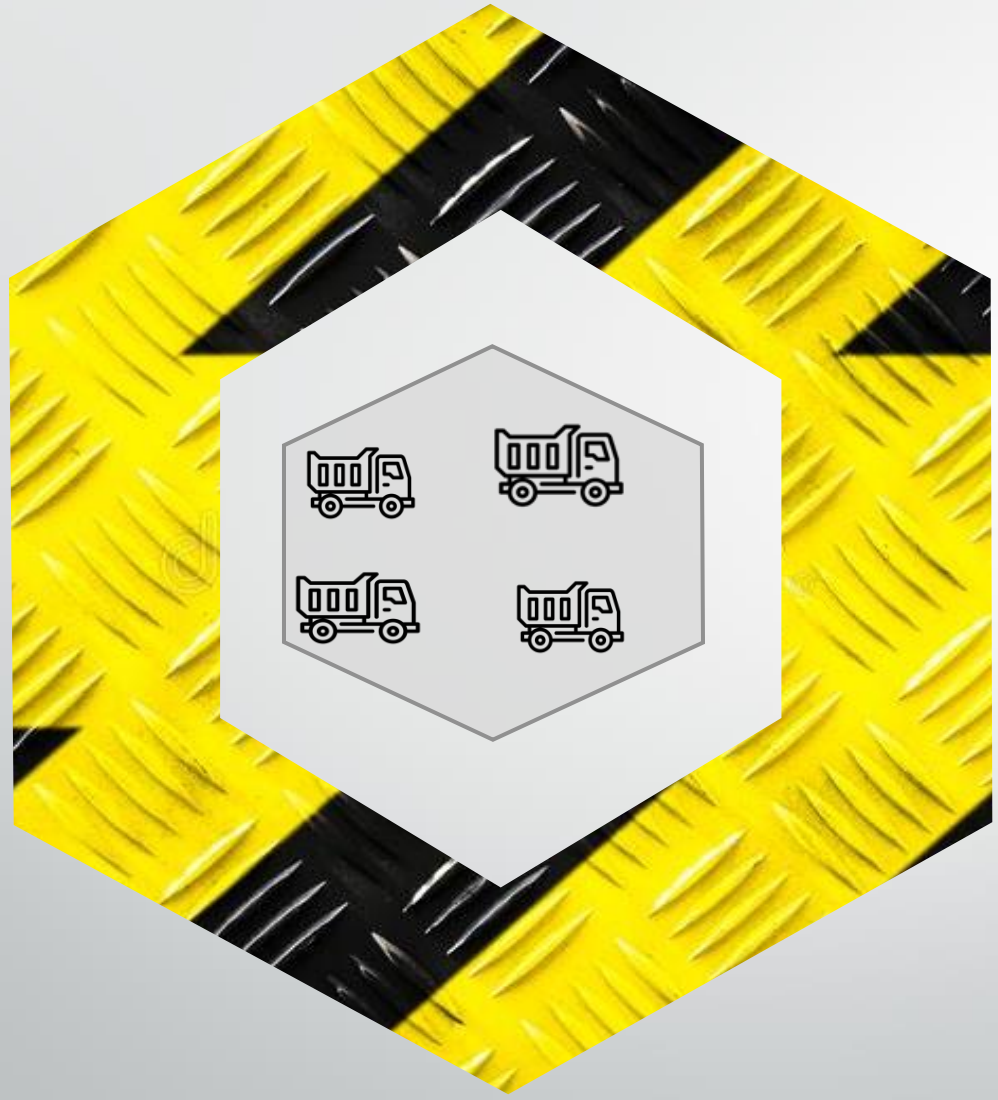
TTMA Upgrades

- MDVR System Integrated with Radar
- 3 X 5 Full Matrix Radar Board
- Dual Cameras
- Programable message board
- Integrated radar board and black box recording system to overlay speed on captured footage



Idle Mitigation

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Reduce emissions

Reduce vehicle and equipment service and repairs

Maintain Warning lights systems

Engine-off A/C Through the Factory Vents
Using anti idle technology, the system provides cooling through the factory vents without running the chassis engine.

Engine-off Heat Through the Factory Vents
The system provides heating through the factory vents without running the chassis engine. You no longer have to enter a freezing vehicle on a cold day!

Lithium-Iron Power to All Electronics
Using safe Lithium-Iron batteries, the system provides power to all electronics (e.g. radio, lights, and computers) without running the chassis engine.

Automatic Recharging
The batteries charge natively from a 12V alternator. Solar panel and shore power integrations are optional.

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ZeroIDLE®

ZeroIDLE prevents the IMS® from automatically starting the engine in "no-idle" zones. The operator can be notified by an optional buzzer, backup alarm, or voice annunciator.

ZeroDRAW™

Our system protects the chassis batteries from being drained from your vehicle's accessories. This protects you from returning to your vehicle to find a dead chassis battery.

Electric PTO Optional

The system can provide energy to powered take-off equipment such as hydraulic buckets, booms, and lifts, all while the engine is off.

- Increased Employee and work zone safety

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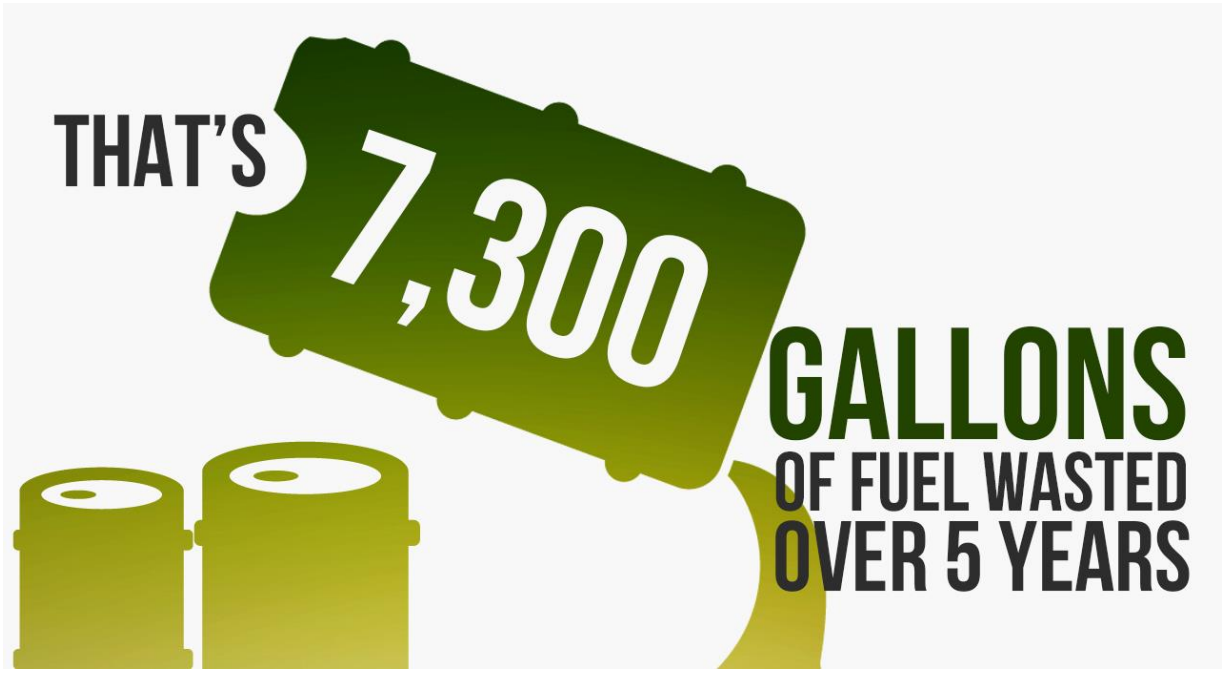
EVERY
HOUR
OF IDLING
CAUSES
33 MILES OF
WEAR
AND TEAR
ON THE VEHICLE


THAT'S
7,300
GALLONS
OF FUEL WASTED
OVER 5 YEARS


PROTECT
THE
ENVIRONMENT
FROM 70 TONS OF CO_2


THE AVERAGE
SERVICE
VEHICLE
IDLES
4 HOURS
PER EVERY
8 HOUR
SHIFT

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