OIL AND GAS INDUSTRY RECOMMENDED PRACTICES FOR IMPROVING SAFETY

Project Background

- The average annual fatality rate among oil and gas extraction workers during the 2000s is more than six times the rate among US workers in general, vehicle incidents constitute 40%.

- Instant feedback from in-vehicle monitoring systems (IVMS) along with coaching from management provided the strongest safety benefits for on-road drivers, however the extent of coaching remains unmeasured.

- In 2011 the National Occupational Research Agenda (NORA) established a strategic goal to reduce the oil and gas occupational motor vehicle fatality rate by 50 percent by the year 2020. This goal was reiterated by NORA in 2018 for 2030.

- NORA O&G Council **NEED**: Small fleets application of IVMS coaching/culture
  - Apply small fleet training, collect coaching, IVMS/MiniDAS data
  - Capture coaching/reporting practices in established large fleets

IVMS / PILOT STUDY RESULTS

Goal #1: Apply small fleet training, collect coaching, IVMS/MiniDAS data

- IVMS installation/tracking within oil and gas fleet: baseline/intervention

Part 1: Deep dive into 5 individual drivers using naturalistic data collection

- Trip activity and Schedules (3 workers, 1 manager)
  - Calculated Commute, Personal, and Site-to-Site trips
  - Nearly 3-hour daily commute on/off highway
  - Daily scheduled work activity 15.4 hours
- Driver questionnaires (5 drivers)
  - Opinions on IVMS remained neutral to positive at study end
  - Drivers rated the future usefulness of receiving real-time speeding alerts very positively
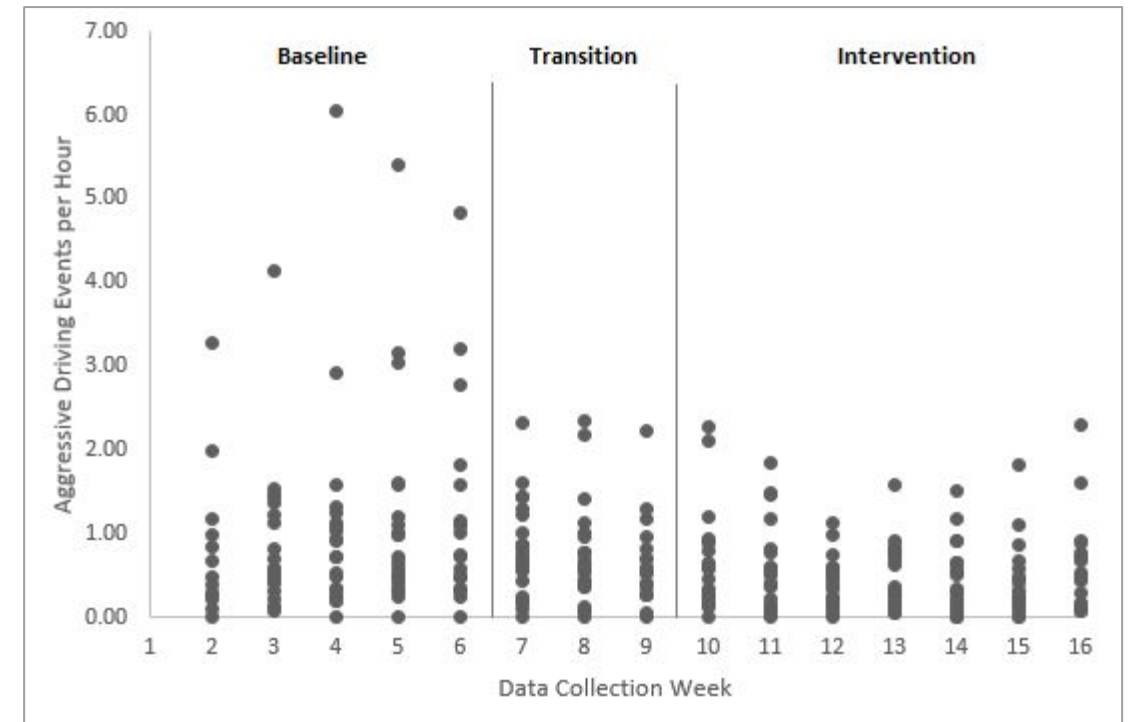
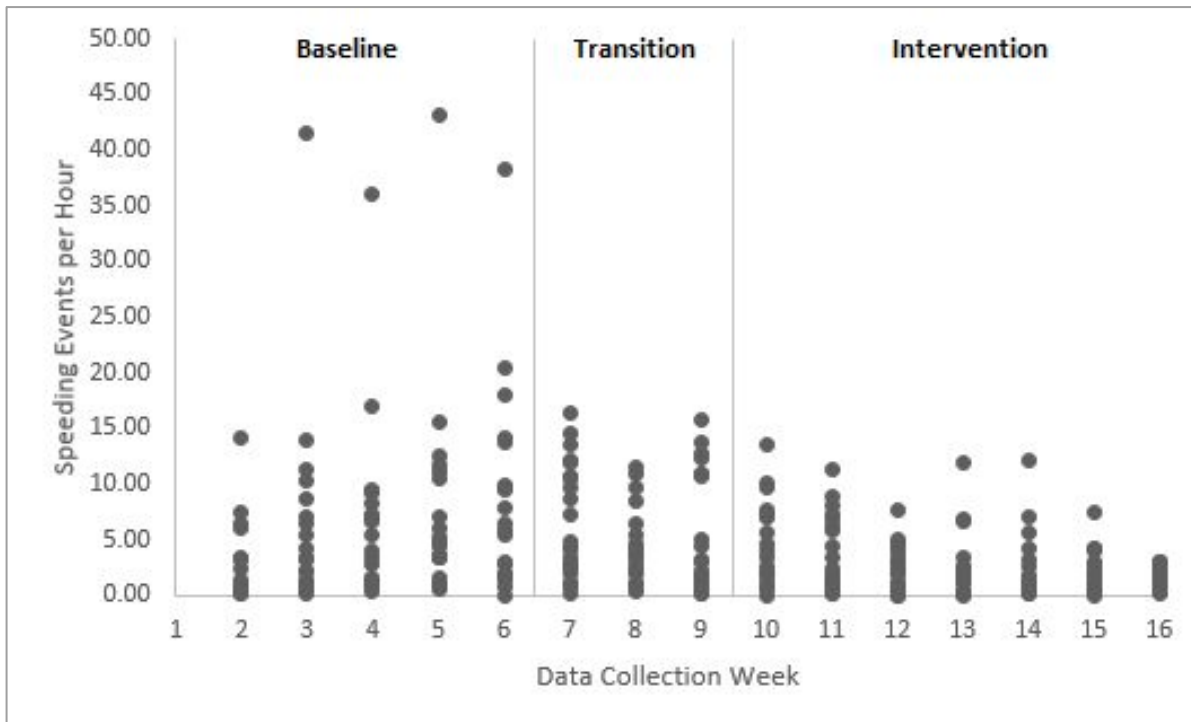|		Arrival Location		
		Home	**Yard**	**Well**
Departure Location	**Home**	Personal	Commute	Commute
	Yard	Commute	Commute	Commute
	Well	Commute	Commute	Site to Site

IVMS / PILOT STUDY RESULTS

Part 2: Investigation into whole fleet behaviors using IVMS data

- Based on driver and manager weekly reports (21 vehicles)
    - Speeding was reduced by 60%
    - Aggressive driving behaviors were reduced by 50%
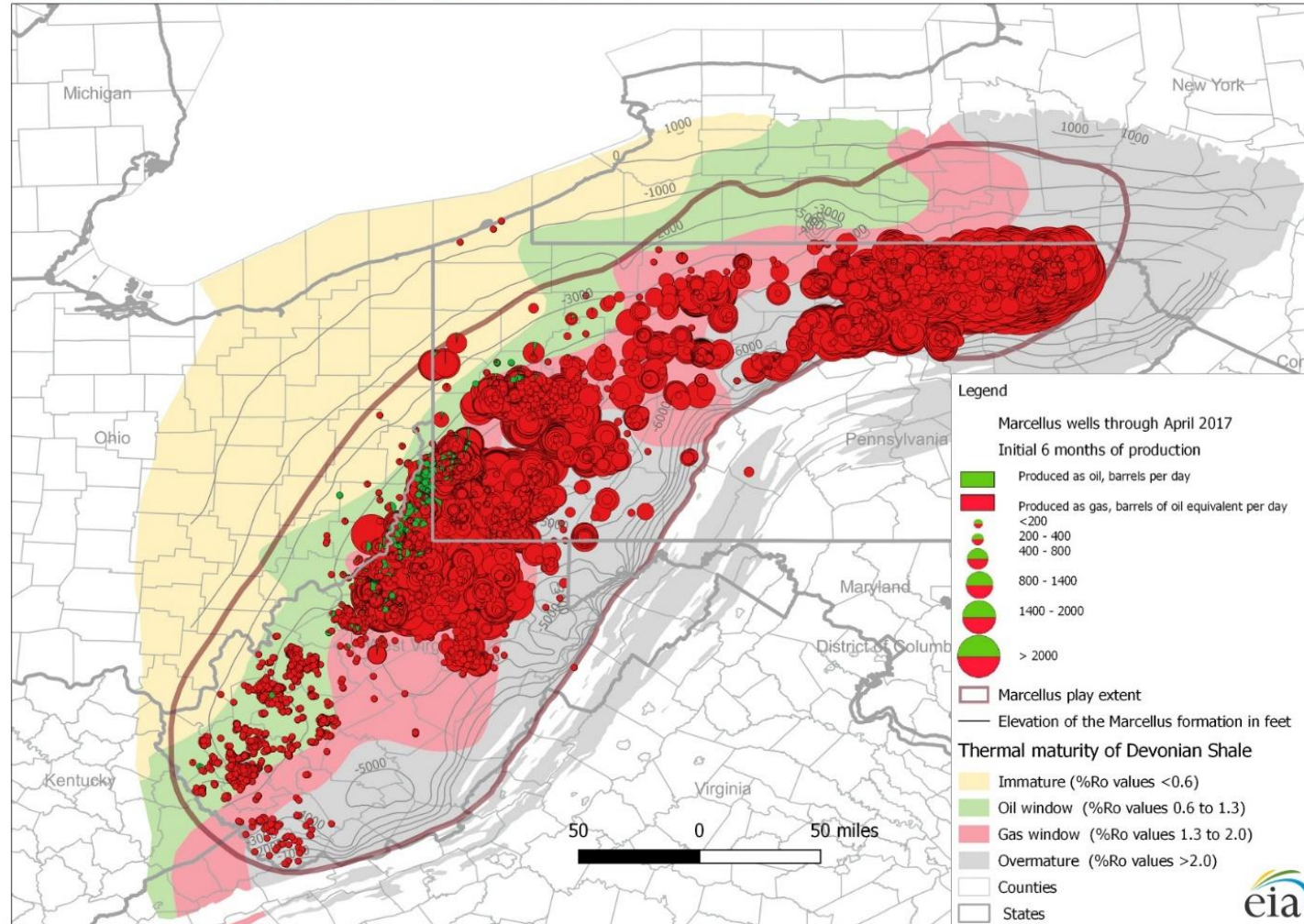   - Efficiency: Average idle time ~22 hours per vehicle/week (unchanged)

RESEARCH ACTIVITIES

Goal #2: Capture coaching/reporting practices in established large fleets

- Met with Oil and Gas Fleets in two major fields: Marcellus (WV) and Permian (TX)
  - Southwestern Energy: Fleet Mgmt. Focus Group (1), Jane Lew, WV
  - Pioneer Natural Resources: Fleet Mgmt. & Driver Focus Groups (2), Big Lake, TX
- Met with Oil and Gas Safety Experts
  - National Safety Experts: NORA O&G Motor Vehicle G. Focus Group (1), (Arlington, TX)
  - Regional Safety Experts: West Texas STEPS Focus Group (1), (Midland/Odessa, TX)
- Initiated relationships in the community
  - ISNetworld (Dallas, TX)
  - Pioneer Natural Resources Corporate (Irving, TX)

RESEARCH ACTIVITIES- MARCELLUS FIELD

Marcellus production through April 2017 and thermal maturity

Legend

Marcellus wells through April 2017

Initial 6 months of production

Produced as oil, barrels per day

Produced as gas, barrels of oil equivalent per day
- <200
- 200 - 400
- 400 - 800
- 800 - 1400
- 1400 - 2000
- > 2000

Marcellus play extent

Elevation of the Marcellus formation in feet

Thermal maturity of Devonian Shale
- Immature (%Ro values <0.6)
- Oil window (%Ro values 0.6 to 1.3)
- Gas window (%Ro values 1.3 to 2.0)
- Overmature (%Ro values >2.0)
- Counties
- States

Source: U.S. Energy Information Administration based on DrillingInfo Inc., Appalachian Oil & Natural Gas Research Consortium, and U.S. Geological Survey.
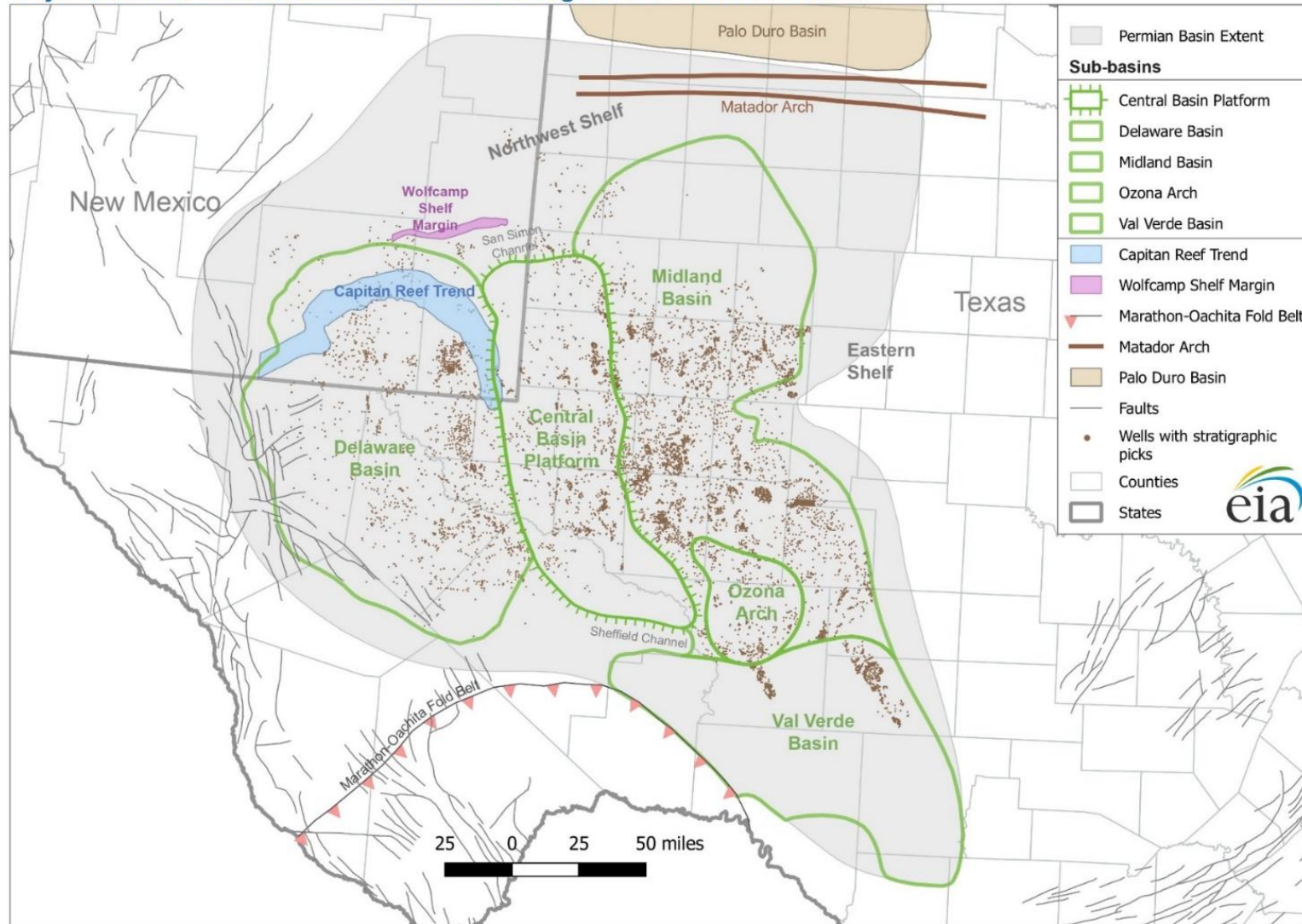
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RESEARCH ACTIVITIES- PERMIAN BASIN

Major structural and tectonic features in the region of the Permian basin

Source: U.S. Energy Information Administration based on DrillingInfo Inc., Bureau of Economic Geology, U.S. Geological Survey.

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RESEARCH ACTIVITIES

- 33 oil and gas industry workers across five focus groups:
  - executive-level safety experts (n=8)
  - safety managers and coordinators (n=6)
  - operational foremen (n=5)
  - supervisors of drivers (n=6)
  - drivers (n=8)
- Seventeen different oil and gas organizations were represented among the thirty-three participants.
- Each focus group had questions tailored according to their level in the organizational hierarchy.

INDUSTRY RECOMMENDED PRACTICES

Organized into the following components:

- Organizational Safety Culture
  - Creating a Shift in Safety Culture
  - Changing Organizational Structures and Policies
  - Using In-Vehicle Monitoring Systems (IVMS)
- Coaching Strategies
- Extra Programs and Opportunities
  - Safety Events
  - Competition
  - Rewards

Using In-Vehicle Monitoring Systems Effectively in the Oil and Gas Industry

NIOSH and the oil and gas industry are taking actions to reduce injuries and fatalities from motor vehicle crashes. These industry-recommended practices include coaching strategies and management directives that can be used in conjunction with in-vehicle monitoring systems (IVMS) to change an organization's safety culture.

Organizational Safety Culture

Organizational culture is the product of multiple goal-directed interactions between people, jobs, and the organization; namely, between psychological, behavioral, and situational factors.

Safety culture is that observable degree of effort by which all organizational members directs their attention and actions toward improving safety on a daily basis.

> *Organizational Safety Culture is executive level commitment to ensuring safety. Employee safety, community safety, and executive level commitment being their willing to provide the resources, financial, human capital and so forth to make those things happen. Personal interest on their part to create metrics to ensure that the value they placed on safety is then carried out throughout the organization.*

Why Safety Culture?

It is important to recognize the impact a safety culture could have on an organization due to the inherent risks associated with extensive driving and the nature of the oil and gas industry. Impacting your organization's safety culture could result in saving the organization time, money, and, most importantly, the lives of employees or others.

> *We've had a lot of these safety meetings and we work around gas—high explosion and fire are potential sources there, and literally, the most dangerous part of our job is getting there.*

POSITIVE SAFETY CULTURE INCLUDES:

- Management commitment to safety
- Management concerns for the workforce
- Mutual trust and credibility between management and employees
- Workforce empowerment
- Continuous monitoring, corrective action, review of systems and continual improvements to reflect the safety at the work site

Creating a Shift in Safety Culture
CHANGE SHOULD:

Come from the top. Executive level commitment to ensuring safety is necessary to make cultural shifts as an organization. If management does not believe in the message, the employees will not.

> *It has to start from the top. The top establishes the focus or the goal and then the whole organization has to support that safety culture or establishes it.*

> *Management has to attend those safety meetings. They're not excluded from them, because they have to be a part to show everybody that it starts here.*

Be proactive. With safety on the mind, being proactive is always better than being reactive. A safety culture will promote a day-to-day safety mindset.

Be actionable. Setting safety-related goals, like a zero-incident day, is a great way to show employees where company values are.

Changing Organizational Structures and Policies

Require reporting. Emphasizing the importance of reporting will show employees accountable, whether to report accidents or to conduct vehicle condition reports.

Introduce in-vehicle monitoring systems (IVMS). When used properly, IVMS has demonstrable effects on employees' behaviors and attitudes towards safety.

Create policy. Policies on seat belt use, cellphones, fatigue, and other driving-related policies are a strong step toward lowering risks taken.

Extra Programs and Opportunities

Safety Events. Provide employees with events during or after work that allows employees and their families to come together. This is a great opportunity to recognize those that have accomplished safety achievements or who have reached certain milestones.

Observation Programs. Create a program where employees observe other employees or individuals at a job site anonymously and comment on their safety-related behaviors–both positive and negative. This is a great way to keep employees thinking about safety.

Competition. Providing a means for employees to see each other's group scores or to see who had the most IVMS events every week is a great way to motivate employees. Involving everyone from site-crews to executive-level management on the public list is a great way to show management's commitment to safety.

Rewards. A year-end bonus or by-event monetary incentive is a great motivator if done fairly, but may not be right for every organization.

> *At the end of the day we want them to go home and we don't want them to hurt anybody else when they're going home.*

In-Vehicle Monitoring Systems (IVMS)

The Oil and Gas Industry is largely moving towards using in-vehicle monitoring systems. These systems provide a number of safety-related features and utility, including:

- Locating and tracking employees and management through real-time GPS
- Capturing driving metrics to help identify good and bad driving performance, such as speeding and aggressive drivinge
- Some IVMS can provide context to the situation by providing forward and face-view cameras.

However, an improperly-used IVMS can have less than desirable effects. To properly utilize IVMS:

- Recognize what is right for your needs and budget. Picking the right tools and metrics are important to capitalizing on areas to improve.
- Get ahead of the installations with your employees and set realistic expectations of what it offers, how it will be used, and what it means to each individual.
- Follow through with utilizing IVMS reports and scores. Conduct coaching sessions with employees based on the IVMS feedback.

> *If you have a tool and no management system, it's a pointless tool.*

> *It doesn't matter how good or how bad it is, if it is not enforced through the company it's never going to work. If it is enforced, it could be the cheapest and it could be best option. If it's enforced it will matter, because it's enforced and people will follow and that's when it will change the culture.*

Coaching Strategies

Coaching is an important tool that can make or break any IVMS system. Coaching is a "one-on-one learning and development intervention that uses a collaborative, reflective, goal-focused relationship to achieve professional outcomes." Use these tips to make you and your managers' coaching experiences with employees useful:

Over time we've seen improvements in the technology, improvement in training that we give to our employees and even improvements into vehicles themselves. But, I think it is also a maturity of our actually safety culture. Our safety culture increases, We're getting better benefits out of the policies and applications that we do in our companies. Because there is a greater focus on safety at the same time.

Allow for autonomy. Many employees enjoy the independence they have with a job. Do not use the IVMS exclusively as a means to punish the employees. Ensure that you do not want to remove their autonomy but would like to work together to create a safer environment.

Create accountability and fair policies. In order to be effective, employees must be accountable for their performance on their IVMS reports. Having a 'three strikes' policy for egregious IVMS violations is typical, but consider what is right for you and your employees.

Sometimes now, accountability is a negative word because in a lot of cases it is used as termination. But there are so many different levels of accountabilities and at least if nothing else gets addressed in an appropriate manner.

Use discretion. With the information the IVMS provides, it is important to provide yourself and your managers the ability to use discretion on how severe violations are and how to proceed during coaching.

There is a general desire in some cases to be vague and general about the policy, so that we don't tie ourselves to any particular metric and force our hand, essentially. 'Vague' gives us wiggle room to be able to deal with one employee one way and another employee another way, what's the most appropriate.

Meet regularly. Set weekly or monthly meetings with your employees, and go through each employee's IVMS report with them. Time is precious to every person and organization. Consider more frequent feedback at a distance through phone/email/text and less frequent meetings in person. In person meetings should be kept brief and to the point. Provide employees with feedback on how they did, what they may need to do better, and allow employees the opportunity to offer explanations and ask questions. It is often as effective to be straightforward about what you do *not* intend to communicate during feedback as it is what you do intend.

Set feasible goals. It is important for employees to have a target performance. Effective goals would include zero driving time without buckled seat belt, fewer than 3 speeding events based on IVMS tracking, or to always perform a walk-around the vehicle to ensure it is safe to move it.

Emphasize teambuilding. Building trusting relationships within the organization will provide social accountability among employees beyond the management-employee relationship and foster a stronger safety culture.

Investigate IVMS triggered events. Investigate with employees events on their IVMS report. This may include why they sped for an extended period of time or had a hard brake at a certain location. This practice is most effective when discussing recent events to avoid memory and contextual loss.

I just don't want to automatically assume, 'you messed up, you sped, you did this.' I want to hear your side. You know, you have to look at every situation.

We have to continually be positive, encourage positive nature to build each other up, to look out for each other, to build that infrastructure. That's what I highly encourage and what we strive for. Because when that happens, we're always looking out for each other, looking for problems, looking for potential hazards, looking for anything that might hurt your buddy or your coworker that you've become friends with.

Look for patterns of behaviors. When looking at IVMS data, patterns of driver behaviors emerge over time. You'll learn about your employee's driving habits and can see what behaviors need to be targeted or how their behaviors are impacted over time with a positive safety culture.

Give positive reinforcement. Providing positive feedback for a job well done is beneficial in both showing that you are paying attention to what employees are doing but also appreciate the effort they put forth. Sometimes it may be best to show the driver the data and allow them to speak without pushing any assumptions about their behavior.

I introduced affirmative inquiry, the idea is problem solve through affirmations rather than going straight to the problem, which inevitably results in some sort of defensive response.

Target the behaviors, not the person. Never criticize an individual's character, instead, target their behaviors if you want to see change. Consider following a behavior-based safety model.

Recognize individual differences. Employees will react differently based on the kinds of feedback you provide. Learn what individuals are comfortable with while still providing useful feedback. For example, managers should be willing to provide personal stories, but don't demand personal information from drivers—rather encourage it.

Do not ask for the unattainable. Setting goals that are not realistic will stifle an employee's ability and desire to achieve that goal. Similarly, avoid asking employees for the impossible, such as working past their hours-of-service for CMV operators.

Perform ride-alongs or field visits. Ride-alongs provide an opportunity for management to interact in a one-on-one situation with employees and gain insight into their driving styles, while field visits allow for management to see how employees work naturally.

Provide feedback outside of normal meetings. Consider giving constructive criticism or positive feedback to employees outside of official meetings.

Be receptive of feedback as a manager. If an employee would like to provide feedback to you or other managers, listen and consider their feedback. Anonymous ways to provide feedback are useful for sensitive information.

Be cognizant about fatigue. Fatigue is one of the most dangerous conditions to drive in. Look for signs of fatigue in employees and consider allowing them to take countermeasures when appropriate, such as a brief nap or coffee.

Remind them why safety is important. Sometimes the strongest messages are framed to focus on what is most important, going home safely to family and friends.

The simplest way is to have the conversation, just a simple conversation. You want to be safe, you want to see your loved ones; you need to take that home. And I think that an important part is having a genuine conversation. A positive message does so much more for me than anything. 'Hey I want you to go home,' and if I believe you I'm more apt to listen to it.

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NEXT STEPS

- Validation of Industry-Recommended Practices*
- Understanding the mechanisms for IVMS implementation and coaching*
- Large scale naturalistic data collection with IVMS installation on small fleets
- Dissemination of materials to oil and gas fleets
- Implementation to other industries with occupational drivers

*VTTI in-progress but paused due to Covid-related issues impact on oil and gas