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Implementing an In-Vehicle Monitoring Program: A Guide for the Oil and Gas Extraction Industry

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Abstract

Significant progress has been made globally in the upstream oil and gas industry in reducing the number and rate of fatalities related to land transport (hereafter referred to as "motor vehicle") related activities. However, motor vehicle crashes remain the leading cause of death to oil and gas extraction workers in the United States.

The U.S. Centers for Disease Control and Prevention's (CDC) National Institute for Occupational Safety and Health (NIOSH) analyzed motor vehicle fatalities in the U.S. oil and gas extraction industry from 2003-2009 (Retzer, 2011). The study made three significant findings: 1) 74% of all motor vehicle-related fatalities occurred to workers employed by companies with less than 100 employees; 2) 30% of the fatalities occurred to employees with less than one year experience with their current employer; and 3) at least 38% were not wearing their seat belt at the time of the fatal crash.

Many large oil and gas extraction companies as well as companies in other industries have found that monitoring their drivers' behaviors is an effective way to reduce the risk of motor vehicle crashes. As recognized by the OGP LTS RP 365, In-Vehicle Monitoring Systems (IVMS) are electronic devices used to identify at-risk behavior as well as seatbelt use, providing data for targeted driver coaching. For large companies, the research, selection, implementation and management of an IVMS program is a daunting challenge; for a small business, it can be overwhelming.

Working with recognized industry leaders, NIOSH has developed tools to assist smaller oil and gas companies and others to reduce risk of motor vehicle fatality. One of these tools is a guidance document for IVMS use: "*Implementing an In-Vehicle Monitoring Program: A Guide for the Oil and Gas Extraction Industry"*. The IVMS guide provides 'best practice' in how to:

- Select the system that best fits a company's needs.
- Successfully implement an in-vehicle monitoring program.
- Best utilize IVMS data to improve motor vehicle safety and reduce fatalities.

The purpose of this paper is to provide information about motor vehicle crashes, describe some benefits of IVMS, and introduce the IVMS guide developed by NIOSH and its partners for the U.S. oil and gas extraction industry.

Introduction

Motor vehicle crashes kill more oil and gas extraction workers on the job in the U.S. than any other traumatic injury. During 2003-2009, the motor vehicle fatality rate for the U.S. oil and gas extraction industry was 7.6 per 100,000 workers. Of all major industry groups, only the transportation and warehousing sector had a higher motor vehicle fatality rate (9.3 per 100,000 workers,) (Retzer, 2012)[1].

Many factors contribute to this, including driving on rural roads that may lack safety features, the movement of large trucks

[1] This research was conducted with restricted access to BLS data. The views expressed here do not necessarily reflect the views of the BLS.

and equipment, and long work hours (Retzer & Hill, 2011) (Mode N.A., 2008). To address this issue, many companies are turning to technology. Oil and gas extraction companies of all sizes, and companies in other industries, have found that monitoring their drivers' behaviors is an effective way to reduce risk (Gale B.R., 2011; Hickman, 2010; Matusalen, 2005; Levick N.R., 2005; Ballard, 2004).

In-Vehicle Monitoring Systems (IVMS), refer to electronic devices that record data such as date, time, speed, acceleration, deceleration, safety belt use of a driver/vehicle. For the purposes of this paper, IVMS includes any device that can perform these functions (e.g. GPS units), but does not refer to in-vehicle technologies such as crash avoidance, lane-departure warning systems, or other similar devices.

IVMS measures driver performance against a predetermined set of parameters. Several types of monitors are available on the market, ranging from simple plug and go devices that record unsafe driving behaviors, to sophisticated systems that track the physical location of large fleets in real time. Time required to install the device varies widely as well, from less than one minute to several hours. While the installation of monitors is comparatively simple, the implementation of an in-vehicle monitoring program is more complex and requires an investment of time and a commitment from all levels of the organization to be successful.

In-vehicle monitoring systems provide important information to support safe driving behaviors, but are not a substitute for a motor vehicle safety program. In order for a company to have a sustained reduction in the risk of motor vehicle crashes, a comprehensive motor vehicle safety program needs to be in place. A number of general guidelines have been developed to help employers implement motor vehicle safety programs. Two of these are Work-Related Roadway Crashes: Prevention Strategies for Employers (NIOSH) and the Guidelines for Employers to Reduce Motor Vehicle Crashes (Occupational Safety and Health Administration). Motor vehicle safety guidance for U.S. employers is also provided by the American National Standards Institute (ANSI)/American Society of Safety Engineers (ASSE) Z15.1 standard, a national consensus standard titled Safe Practices for Motor Vehicle Operations (ANSI/ASSE, 2006). The International Association of Oil and Gas Producers (OGP) released a Land Transportation Safety Recommended Practice, Report #365, for the oil and gas exploration and production industry specifically (2005). It is based on best practices for the industry and provides tools to support implementation. The OGP recommendations advise that oil and gas operators address motor vehicle crash risk for their employees on and off drilling sites. It also advises oil and gas operators to hold their contractors to the same high level of road safety performance. The OGP Recommended Practice recommends that all company vehicles (owned, leased or contracted for greater than 3 months) have IVMS installed (OGP, 2005).

More research is needed to quantify the effects of IVMS on improving driver behaviors and reducing motor vehicle-related crashes and injuries in the workplace. However, based on the information from the oil and gas industry experts in this study, these systems seem to be an effective tool to improve motor vehicle safety when properly selected, installed, maintained and managed.

Methods

NIOSH developed a questionnaire to ask motor vehicle safety professionals in this industry about their experiences with IVMS. Nine experts were interviewed from seven different oil and gas companies (two operators and five well servicing companies). Interviews were conducted by phone or in person. Interviewees were asked questions about many different aspects of their IVMS program, including benefits of IVMS, steps of implementation, successes and challenges, selection criteria, driver buy-in, management buy-in, etc. The information collected was compiled into themes and assembled into the first draft of a guide on the implementation of an IVMS program.

A workgroup was assembled to review the draft guide. The members of the NIOSH Oil and Gas Motor Vehicle Workgroup included five of the interviewees, a representative from the NIOSH Center for Motor Vehicle Safety, an insurance representative, and two staff and two contracted consultants of the NIOSH Oil and Gas Extraction Safety and Health Program. The members reviewed each section of the booklet. The material was organized and enhanced as necessary. The guide then underwent an internal NIOSH review by motor vehicle safety experts and an external review process with industry experts.

This guide should help oil and gas extraction companies of all sizes to:

- Decide whether to install monitors in company vehicles.
- Select a system that meets their company's needs.
- Successfully implement an in-vehicle monitoring system.
- Employ the data provided by monitors to improve motor vehicle safety.
- Effectively track its effects on motor vehicle crash rates.

This guide does NOT cover all of the essential components of a motor vehicle safety program. Guidelines mentioned in the Introduction should be utilized to design a comprehensive program prior to the implementation of IVMS. Because IVMS technology is advancing rapidly, this guide may also not cover all of the features available in various IVMS products.

Benefits of IVMS

There is a need to reduce motor vehicle fatalities in the oil and gas extraction industry. The safety and other benefits of in-vehicle monitoring were collected through a review of government reports, journals, and articles published in SPE literature. The following list summarizes a few of the benefits reported in the literature.

1) Reduces motor vehicle crash rates:
   - A reduction in the overall motor vehicle crash rate ranged from 50%-93% among companies who implemented IVMS in combination with a motor vehicle safety program (Gale et. al, 2012, Mora et. al, 2010, Velasquez, et. al, 2010, Matusalen, et. al, 2006, Ballard et. al, 2004, Jutten et. al, 2002, Cocianni & Taviansky, 1998).
   - A reduction in the high-potential, catastrophic, major or serious accident rate was 70-100% (per definitions in OGP-Land Transportation Safety Recommended Practice, Report #365-5) (Allen & Fee, 2010, Lopez, et. al, 2006, Jutten et. al, 2002, Twilhaar, 2000).
   - An independent evaluation funded by the Federal Motor Carriers Safety Administration (FMCSA) of an IVMS was conducted within two commercial vehicle operations over 17 weeks. The monitoring combined with behavioral coaching was responsible for a significant reduction in safety-related 'events' in both carriers. Carrier A reduced their events by 38% and Carrier B by 52% (Hickman, 2010).
   - Three years of data were collected from a fleet of more than 2,000 vehicles that drove more than 50 million miles a year in the continental U.S. There was more than a 50% reduction in automotive incidents (per million miles driven) and more than a 70% reduction in high-potential automotive incidents per year (Ballard T, 2004).
2) Reduces speeding:
   - For every 1 mile-per-hour decrease in speed, there is a corresponding 5% reduction in crash frequency. In addition, the consequences of collision are less serious when the impact speed is lower (Finch, 1993) (Taylor, 2000).
   - SPE published literature reports a 60% reduction in speeding (Twilhaar, 2000).
3) Encourages safety belt use:
   - Half of the U.S. oil and gas extraction workers who died during 2003-2009 were either not wearing a safety belt (38.6%) or were ejected from the vehicle and presumably, not belted (11.9%)(Retzer, 2011)[2]. Increasing safety belt use should be a priority for employers and industry partners as it is the most effective measure for protecting workers from injury during a motor vehicle crash.
   - While the use of safety belts may not prevent a crash, they can prevent a fatality or serious injury. Forty-nine states legally require safety belt use for all drivers. When fitted with a safety belt sensor, the IVMS system allows a company to monitor and coach drivers in their use.
   - A prospective study of 250 emergency vehicle drivers was conducted over a period of 18 months to determine if an onboard computer-monitoring device with real time auditory feedback could improve driver behavior. Safety belt violations dropped from 13,500 to 4 per month. The number of over speed violations decreased from 550,353 to 2,709 per month. There was also a 20% saving in vehicle maintenance costs within 6 months (Levick NR, 2005).
4) Reduces fuel costs and environmental impacts.
   - According to SPE published literature, IVMS systems have reduced miles driven from 8%-20% (Lopez, 2006, Twiilhar, 2000), and can also be used to monitor and reduce idle time. These reductions will lead to a corresponding decrease in CO2 emissions.

The Guide

This guide is a collection of information provided by motor vehicle safety experts in the oil and gas industry who have implemented in-vehicle monitoring systems and experienced a reduction in their motor vehicle crash rates. The guide provides motor vehicle fatality data for the oil and gas extraction industry, examples of successes using IVMS, and 4 simple steps for IVMS in a company. The appendices include a list of common IVMS features and other supplemental tools for an IVMS program.

[2] The authors reviewed the narrative field in the CFOI dataset for information about safety belt use, speeding, and other risk factors contributing to each crash.

Oil and gas motor vehicle safety experts recommended a structured approach to implement an in-vehicle monitoring program, including the following:

1. Select- Select an IVMS and conduct a pilot project.
2. Plan- Determine who will be monitored, establish staff roles, and develop training and communications campaign for drivers.
3. Deploy- Rollout the program.
4. Review- Monitor performance and adjust the IVMS where necessary.

There may be less need for formal planning in a smaller company; however the process will be the same.

The guide provides key questions to consider in deciding whether IVMS is right for your company. It covers the basic costs encountered when investing in a program and the numerous safety, economic, and other benefits reported by experts. The guide discusses key considerations for a company during each step of the implementation process. It also introduces what should be considered when establishing a recognition and accountability program using IVMS data, and the importance of timely coaching with drivers who receive low scores. The guide also provides some common concerns of drivers who are introduced to IVMS and how to address them.

Dissemination and Evaluation Plan

The guide will be available on the NIOSH website (www.cdc.gov/niosh). NIOSH and the members of the NIOSH Oil and Gas Motor Vehicle workgroup will present this guide in numerous venues throughout the United States and make copies available in hard copy and electronically. The guide will be distributed through the “STEPS” network (U.S. regional safety and health organization comprised of oil and gas extraction professionals) meetings and through their websites. The guide will be presented at regional conferences where smaller companies who may be considering the implementation of an IVMS are in attendance. It will also be provided to insurance companies to operators and to the Association of Energy Service Companies (AESC) for distribution.

The authors also intend to evaluate the effectiveness of this guide. The number of downloads from the NIOSH website and the distribution of hard copies will be tracked. A survey of individuals who have received the guide will be conducted and feedback on the utility of the guide will be gathered. Any resulting changes in company policy towards IVMS or changes in motor vehicle crash rates related to the use of the guide and other data or testimonials will also be gathered.

Conclusion

The motor vehicle fatality rate is high for this industry and is the leading cause of death. IVMS in conjunction with a comprehensive motor vehicle safety program have been shown to be a promising tool to improve driving behaviors and reduce motor vehicle crashes in this industry. The goal of the guide *Implementing an In-Vehicle Monitoring Program: A Guide for the Oil and Gas Extraction Industry* is to provide companies with a useful reference for implementing a successful IVMS program. IVMS is most effective when part of a comprehensive motor vehicle safety program – it should not be seen as a ‘silver bullet’. IVMS may not provide the same return on investment for all situations, so companies need to carefully consider the variety of devices available to select the product that best meets their needs.

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