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WHITE PAPER

Improving the Bottom Line with Collision Avoidance Systems

Measuring the return on investment and cost savings of collision avoidance technology

Introduction

Reducing collisions is a top priority for fleet managers. Beyond safety concerns for fleet drivers, the financial burden and logistical headache of collisions is a main motivator. From direct costs like motor vehicle repair and replacement to indirect costs like loss of business and administrative burden, even one collision can set off a domino effect of losses. There are a number of ways fleet managers put effort into reducing or mitigating these costs; implementing a company-wide safety culture, driver training and policy workshops, utilizing telematics to track and incentivize safer driving habits, installing dash cameras to exonerate drivers who are not at fault. All of these help to tackle the challenge, but today fleets are taking further steps to avoid incidents by equipping their vehicles with collision avoidance technology.

Collision avoidance systems are not an end-all solution. However, as opposed to the other common methods laid out above, collision avoidance systems directly address the issue. Collision avoidance systems either come installed in new vehicles or can be retrofitted to existing fleet vehicles. These systems generally provide driver-assist features like pedestrian detection, forward collision warnings, and lane departure warnings to provide drivers with the critical seconds needed to avoid or mitigate a collision.

Some fleets are reluctant to buy new vehicles or retrofit collision avoidance technology because this requires an upfront investment where the return is ostensibly uncertain. But investing in safety, as with any other business decision, must be looked at from a financial perspective. While the research shows that adding collision avoidance systems to your vehicles will protect fleet drivers and road users, how will it directly impact the bottom line?

This paper will give insight into why most collisions happen, how collision avoidance systems work, how collision avoidance systems can improve fuel efficiency, and how to track savings and return on investment (ROI) for collision avoidance technology. After reading this paper, you will be able to make an informed decision and work out whether collision avoidance technology makes sense for your fleet.

True Costs of Collisions

Evaluating the total cost of all collisions requires understanding the different ways a collision impacts a business and the costs related to each. The direct costs need to be accounted for, while also factoring in additional indirect costs. Putting a value on these indirect costs is vital to understanding the true overall cost of a collision. The Occupational Safety and Health Administration (OSHA) offers a worksheet (see Appendix A) for fleet managers to understand the true cost of collisions. Furthermore, the European Transport Safety Council (ETSC) estimates the indirect costs of a collision to be at least two times higher than the reported cost of a collision.

Direct Costs	Indirect Costs
Worker's compensation benefits	Supervisor's time (rescheduling, making special arrangements)
Healthcare costs	Fleet manager's time to coordinate vehicle repair, replacement, etc.
Increases in medical insurance premiums	Reassignment of personnel to cover for missing employees (less efficient)
Auto insurance and liability claims and settlements	Overtime pay (to cover work of missing employees)
Physical and vocational rehabilitation costs	Employee replacement
Life insurance and survivor benefits	Re-entry and retraining of injured employees
Group health insurance dependent coverage	Administrative costs (documentation of injuries, treatment, absences, crash investigation)
Property damage (equipment, products, etc.)	Inspection costs
Motor vehicle repair and replacement	Failure to meet customer requirements resulting in loss of business
EMS costs (ambulance or medivac helicopter)	Bad publicity, loss of business
Vehicle towing, impoundment and inspection fees	
Municipality or utility fees for damage to roads, signs or poles	

Note: The table is not necessarily exhaustive; also, it is not always clear into which side of the table a particular cost ought to fall.

What Makes Collision Avoidance Systems Effective

Before looking at how collision avoidance systems work, one must understand the main causes of collisions. A study by the National Highway Transportation Safety Administration (NHTSA), revealed that 94% of collisions are caused by driver error. In other studies conducted by the NHSTA, it was found that nearly 80% of crashes involve driver inattention within three seconds before the event and 40% of rear-end collision involve no brake application whatsoever. When looking at road fatalities it was found that 60% of road fatalities are due to unintended lane departures and pedestrians account for 22% of those fatalities.

94% of accidents
are caused by driver error

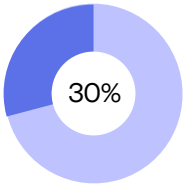
Nearly 80% of crashes involve driver inattention within three seconds before the event

AXA, one of the world's leading insurance companies, did further analyses into forward collisions and found that if drivers were given a mere 1.5 seconds of warning, this could prevent 90% of rear-end collisions, and 2 seconds of warning could prevent nearly all such collisions. Collision avoidance technology was designed around statistics like these and to address these specific types of collisions. The logic being that if drivers could receive warning about an imminent collision in time to act, then the severity of the collision could be lessened or, better still, the incident could be avoided altogether.

Collision avoidance systems use a variety of sensors that are capable of detecting unavoidable obstructions in front of a moving vehicle. Depending on the particular system, it may then issue a warning to the driver or take any number of direct, corrective actions.

Collision avoidance systems utilize driver assist features like forward collision warning (FCW), headway monitoring and warning (HMW), lane departure warning (LDW), and pedestrian and cyclist collision warning (PCW) to provide drivers with the critical seconds needed to avoid or mitigate a collision. Most new vehicles include automatic emergency braking (AEB). AEB differs from FCW in that AEB systems actually intervene and brake the vehicle if the driver fails to do so. Studies advanced driver assistance features like these have the potential to prevent 30 percent of all collisions.

2 seconds of warning
Could prevent nearly all forward collisions



30% of collisions
Could be prevented with ADAS

Improving fuel efficiencies and other benefits with collision avoidance systems

In addition to avoiding collisions, safety technology has been shown to provide other benefits such as reduced fuel costs.

Improve Fuel Efficiency with Headway Monitoring and Warning

Fuel makes up roughly 34 percent of a fleet's marginal costs. Poor driving habits such as hard breaking and speeding can waste fuel, adding up to 33 percent in extra fuel costs. Headway Monitoring and Warning (HMW) warns if the distance to the vehicle ahead becomes unsafe. This encourages drivers to maintain a safe distance with enough time to break. Pilot studies have observed at least 2% increase in fuel efficiency when using these types of warning systems.

Illustrating Social Responsibility

Companies that invest in safety demonstrate their social responsibility. They're showing that they want to make the roads a safer place. Purchasing and installing new safety technology throughout a fleet creates opportunity for well-earned PR. Use the opportunity to show the organization's focus on safety, both for employees, other drivers and all road users.

Protecting the Brand

Safer fleets also protect, even enhance, a company's brand by showing their commitment to safety. If a certain fleet has a higher-than-average crash frequency, it will develop a poor reputation within the industry, its customers and the public at large. On the other hand, brands that invest in new technology cultivate a positive status for being focused on safety.

Measuring Return on Investment (ROI) of Collision Avoidance Systems

A fleet will invest in collision avoidance systems to reduce collisions, but measuring the ROI of this technology is difficult. Typically, ROI is measured by deducting the financial gain of an investment from the cost of the investment, then dividing that by the cost of the investment. The result is expressed as a percentage, and anything over 100% indicates that the investment resulted in a positive gain.

Discovering ROI for advanced driver assistance technology is more complex. It is nearly impossible to quantify the amounts saved due to collisions that didn't happen – the near misses. There's not necessarily a clear and direct financial gain when investing in increased safety. Calculating true ROI depends on identifying correct safety metrics. Once identified, they must be tracked before and after instituting the new technology.

$$ROI = \frac{\text{Gain from Investment} - \text{Cost of Investment}}{\text{Cost of Investment}}$$

Charting Fleet Safety

Selecting the right metrics to track is vital in measuring the ROI of safety technologies. Gaining a deeper understanding of these metrics helps to substantiate the value and justify the cost of safety systems, along with identifying driver trends that can further improve overall safety.

Some of the key safety metrics every fleet manager will benefit from tracking:

Collisions per Million Miles

$$\frac{\text{Number of Crashes within 12 Months X One Million}}{\text{Total Miles Driven by the Entire Fleet}}$$

Vehicle Crash Rate - Collisions per Million Miles

This metric identifies the frequency of collisions. It is calculated by multiplying the number of crashes over the previous 12 months by 1,000,000, which is then divided by the total number of fleet miles traveled for the previous 12 months. The resulting figure represents the frequency of collisions per million miles.

Collisions per Fleet Size

$$\frac{\text{Number of Crashes within 12 Months}}{\text{Total Number of Fleet Vehicles}}$$

Vehicle Crash Rate - Collisions per Fleet Size

This metric also identifies the frequency of collisions. But It is calculated by multiplying the number of crashes over the previous 12 months and then dividing it by the total number of fleet vehicles.

Total Collision Cost

$$\underbrace{\text{Own Damage Costs + Third-Party Vehicle Costs + Third-Party Injury Costs}}_{\text{X2}}$$

Total Collision Cost

This metric aims to provide a form number for the total cost of all collisions in a 12-month period. It also accounts for indirect costs using the ETSC estimate described above.

Average Costs of a Collision

$$\frac{\text{Total Collision Cost}}{\text{Total Number of Collisions}}$$

Average Costs of a Collision

A similar metric to Total Collision Cost, this figure is reached by dividing the total collision cost by the total number of collisions over the same timeframe.

Tracking the savings of new safety technology

Experiencing a decreased crash rate is one of the best metrics for measuring overall improved fleet safety. Additionally, seeing a lower average collision cost means collisions have become less severe, perhaps thanks to lifesaving information provided by safety technology. Given enough new data, it's possible to see how the new technology is saving money by reducing the occurrence, severity and therefore costs of collisions.

It is also important to track fuel savings. This can be done by comparing fuel costs before and after the installation of a collision avoidance system.

$$\text{Fuel Cost} = \frac{\text{Annual Mileage Driven}}{\text{Fuel Consumption in Miles per Gallon}} \times \text{Fuel Cost per Gallon}$$

Fuel Cost

To calculate fuel costs, take mileage driven and divide it by the miles per gallon. Then multiply this by the fuel cost per gallon of gas.

To return to the ROI formula, deduct the combined total collision and fuel savings from the cost of the safety technology. Divide this number by the cost of the safety technology. Instead of a percentage that indicates gain, as with most ROI calculations, the percentage will indicate how much money was saved.

$$\text{ROI} = \frac{\text{Year-Over-Year Savings on Crashes} - \text{Cost of Safety Technology}}{\text{Cost of Investment}}$$

Collision avoidance technology enhances the entire business

Fewer collisions almost certainly decreases the total cost of all fleet collisions. As this paper has mentioned, collision avoidance systems might reduce collisions by 30%. Additionally, unavoidable collisions would likely be less severe because the driver had extra time to react, thanks to alerts. Altogether, each of the finance metrics related to collision expenses is reduced due to collision avoidance technology. Furthermore, there might be savings due to increases in fuel efficiency, estimated at 2%.

Using safety metrics like vehicle crash rate and total collision costs along with the estimated collision reduction and fuel efficiency improvements, a payback period and ROI can be estimated in order to inform a purchase decision. It will likely show that over the course of six months to a year, less will be spent on covering collision costs. These same metrics must be tracked after the collision avoidance system is implemented to prove cost savings.

These cost savings have the potential to enhance the entire business. In addition to having more capital available for the fleet, enhanced safety statistics boost an organization's reputation within the industry. Drivers will appreciate being safe and cargo will be protected. Over time, investing in safety technology could foster growth throughout the entire business.

About Mobileye

Mobileye is a global leader in collision avoidance and computer-vision artificial intelligence. With technology trusted by dozens of OEMs, Mobileye's safety solutions aim to reduce collisions and improve driver performance for fleets across all industries through real-time, proactive alerts.

Equipped with our latest generation vision sensor, Mobileye collision avoidance is suitable for almost any vehicle. After installing Mobileye, our clients have experienced significant safety improvements, as well as reduced expenses, downtime, and costs. Whatever your fleet size or safety challenges, we can help you achieve the same.

Visit https://ims.mobileye.com/fleets/us/ to learn more.

Endnotes

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