Author: **Allen, Richard R.**

Title: ***Improved Safety Performance through Measurement, Monitoring, and Supervisory Involvement***

The accompanying research report is submitted to the **University of Wisconsin-Stout**, **Graduate School** in partial completion of the requirements for the

Graduate Degree/ Major: MS Operations and Supply Management

Research Advisor: James Keyes, Ph.D.

Submission Term/Year: Fall 2018

Number of Pages: 48

Style Manual Used: American Psychological Association, 6th edition

☒ **I have adhered to the Graduate School Research Guide and have proofread my work.**
☒ **I understand that this research report must be officially approved by the Graduate School. Additionally, by signing and submitting this form, I (the author(s) or copyright owner) grant the University of Wisconsin-Stout the non-exclusive right to reproduce, translate, and/or distribute this submission (including abstract) worldwide in print and electronic format and in any medium, including but not limited to audio or video. If my research includes proprietary information, an agreement has been made between myself, the company, and the University to submit a thesis that meets course-specific learning outcomes and CAN be published. There will be no exceptions to this permission.**
☒ **I attest that the research report is my original work (that any copyrightable materials have been used with the permission of the original authors), and as such, it is automatically protected by the laws, rules, and regulations of the U.S. Copyright Office.**
☒ **My research advisor has approved the content and quality of this paper.**

STUDENT:

NAME: Richard R. Allen **DATE: 11/18/2018**

ADVISOR: (Committee Chair if MS Plan A or EdS Thesis or Field Project/Problem):

NAME: James Keyes, Ph.D. **DATE: 11/18/2018**

This section for MS Plan A Thesis or EdS Thesis/Field Project papers only

Committee members (other than your advisor who is listed in the section above)

1. **CMTE MEMBER'S NAME:** **DATE:**
2. **CMTE MEMBER'S NAME:** **DATE:**
3. **CMTE MEMBER'S NAME:** **DATE:**

This section to be completed by the Graduate School

This final research report has been approved by the Graduate School.

Director, Office of Graduate Studies: **DATE:**

Allen, Richard R. ***Improved Safety Performance through Measurement, Monitoring, and Supervisory Involvement***

Abstract

This paper summarizes the efforts of TC Electric to define a Safety Management System that is modern, aligned with organizational objectives and focused on attaining zero injury culture in the most effective and efficient means possible. TC Electric Safety Management System consists of six complementary and overlapping elements. The first and most essential element is Leadership and Employee Involvement. Remaining components of the system include; Training, Planning Performance Monitoring & Measurement, Incident Management, and Recordkeeping. It is the belief of the TC Electric leadership that through visibility and engagement combined with effective development and implementation of the Safety Management System we will achieve higher levels of performance and get steps closer to the zero-injury culture we are working towards.

For TC Electric this systematic and collaborative approach represents significant change in mindset and culture across the company. For many years safety was viewed as a support function that while necessary did not directly create or add direct value to the organization. It is through recent declines in safety performance and realization that anything less than impeccable performance will affect TC Electric's ability to grow and flourish within the industry.

Acknowledgements

Thank you to my wife Kim for her patience and support, sacrificing weekends and evenings, all on top of the time away that is part of my job. Without her support and encouragement completing this program would not have been possible. Finally, I would like to thank Dr. James Keyes for being patient with my erratic travel schedule and for the guidance and encouragement I needed to get this paper back on track and completed.

Table of Contents

List of Figures

Chapter I: Introduction

TC Electric, actual name withheld to protect confidentiality, is a full service electrical contractor specializing in large scale commercial & industrial construction, electrical service, and maintenance. In recent years TC Electric expanded technology service capability to include; audio/visual systems, security systems, and computer network infrastructure. Today, TC Electric is a full service electrical contractor company with six business divisions, headquartered in nine locations operating under four different company brands with combined annual revenue more than $300,000,000.

In 2010 TC Electric had 425 employees who worked approximately 845,000 hours supporting construction and service divisions. The majority of work performed by TC Electric occurred within a 100-mile radius of company headquarters located in suburban Minneapolis. In 2017 TC Electric performed over 2.2 million hours of work throughout the Midwest and Southwest United States.

Construction accounted for 70 percent of the work performed, followed by technology construction and installations at about twenty percent. The remaining ten percent of the work performed was civil support and service work. While TC Electric works projects of many sizes and types, the majority of work performed was supporting electrical construction and installation for large scale new construction projects such as major sporting venues, regional medical centers, and data centers.

Resulting from a significant period of growth and accession TC Electric experienced from 2010 to 2017, TC Electric did restructure leadership and management functions to accommodate the need for navigating operations of the larger company. While the operational management functions expanded and adapted to accommodate growth, the still centralized safety

function remained essentially untouched and unchanged in terms of size, work methods, and program development. As had been the case when TC Electric was a smaller organization, the operational leaders of the organization remained highly dependent on the safety function to independently manage critical functions of employee safety training, incident investigation, record management and reporting, and performance measurement. While it was accurate to say leadership supported safety, it was equally accurate to say there was not a high level of management or supervisory involvement within the safety process or its functions.

In addition to challenges faced by TC Electric's Safety Department in keeping up with the expanding day to day responsibilities associated with company growth, there were numerous regulatory changes that commanded Safety's attention as well. These challenges included new silica standards, revised confined space rules, and changes in hazardous communication requirements just name a few.

Beyond expansive growth and regulatory demands, clients and general contractors were elevating their safety performance expectations as well. Clients and contractors made it clear in recent years that nothing was more important on their projects than worker safety. They invested heavily in their safety resources and related systems and expect those performing work under them to do the same. Expanded expectations of clients and general contractors included requests and requirements to develop programs, provide additional levels of worker certification and training, increased demand for managerial and safety professional involvement on the work site, and more stringent contractor pre-qualification requirements.

In early 2017 TC Electric leadership was concerned with upward trends in annual incident rates and at fault motor vehicle incident rates. Beyond potential impacts the negative trends posed with worker safety and regulatory compliance, there was genuine concern we were

losing our ability to meet client performance expectations. Without change, TC Electric could jeopardize being a preferred electrical contractor to many general contractors and clients they had developed long standing relationships over the years or in some cases, decades.

As the first step, TC Electric leadership opted to reorganize and expand the safety organization and brought in fresh leadership in the form of a new Safety Director in December of 2017. As new Safety Director, was tasked with making recommendations to how TC Electric could improve safety performance in the most impacting and visible ways possible. After a short period of observation and organizational assessment, there were a number of recommendations put forth to improve performance.

First and foremost, the safety function was not adequately staffed to meet the needs of the organization. There was simply an inability to keep up with day to day demands of employee training, participation in project planning, incident management and investigation, and still maintain a meaningful presence in the field coaching and mentoring field leaders and workers towards zero incident performance. Safety had become an almost entirely administrative function. Approval was quickly granted to expand the safety team with two additional team members.

Another opportunity to make immediate gains was to increase the quality and quantity of safety performance data provided to senior leadership throughout the year. If there is expectation of leadership to be engaged and involved with safety they first must be informed.

The most potentially impactful recommendation made was to increase management and supervisory involvement in the safety process throughout the organization. With six safety professionals supporting over 1,000 employees working dozens of projects dispersed throughout

the country there were two options; further expand the safety staff to provide more direct safety oversight or solicit the support of field leaders. TC Electric opted for the latter.

Getting supervisors to be actively engaged in safety management was not a new concept to the company. In fact, it had been attempted recently at TC Electric early in 2017 prior to safety department restructuring. Unfortunately, the roll out of the safety inspection initiative proved ineffective. Primarily, because the inspection system did not provide means to collect and monitor data, record completion, or provides meaningful feedback to the field.

Despite the good intentions of garnering supervisory involvement, the effort quickly stalled, and TC Electric safety performance continued to decline. In fact, 2017 proved to be the worst statistical year on record in terms of safety performance since 2005.

Statement of the Problem

Since 2015 safety performance of TC Electric has declined to substandard levels. TC Electric leadership was legitimately concerned that degraded safety performance through increased incident frequency would elevate the likelihood of more severe incidents and injuries. There was also concern substandard safety performance could have jeopardized the company's ability to remain eligible for work with key clients due to loss of confidence in TC Electric's ability to meet their safety performance expectations.

Purpose of the Study

The outcome of this study was improved statistical safety performance. This was accomplished through increased supervisory and management engagement, along with systematic monitoring and measurement of worker safety and driver performance. The benefits of supervisory involvement and safety performance monitoring and measurement are safer work

sites, reduction in incident and issue frequency, and on the job sites improved relationships with clients and contractors.

To address oversight of vehicle operators, direct supervisory oversight was not a practical option. TC Electric addressed this challenge by equipping company owned and leased vehicles with fleet safety devices. Fleet safety device is an apparatus that once installed in the vehicle, uses global positioning technology and telematics to allow supervisors and managers observe, review and respond to driver behaviors. The objective was reduction in motor vehicle incident rates amongst fleet drivers to reduce losses due to vehicle damage and also reduce potential for serious injury incidents.

Assumptions of the Study

The study did not include quality review or trending of the supervisory inspection results. Team assumed all completed inspections were done in good faith, and not simply filled out to meet the administrative requirement.

It was expected that renewed leadership emphasis also had some effect on the improved safety performance in addition to the areas of monitoring and measurement with supervisory engagement that were the focal points of the study.

Definition of Terms

The following terms are defined to explain items and frequently used or provide further depth into industry specific terminology.

Total recorded incident rate. Frequency of fatal and nonfatal injuries and illnesses for a specified period, typically calendar year per 200,000 employee hours worked (Haight, 2008).

Limitations of the Study

The implementation and roll out of the supervisory engagement and driver improvement initiatives took place in early 2018. The resultant effect was limited data on which to base conclusions. While data generated through this study was small of a data set to prove definitive correlation, there were sufficient indicators to support the initiatives had desired positive effect on TC Electric statistical safety performance.

Methodology

There were two areas TC Electric leadership believed immediate impact on organizational safety performance could be achieved in terms of injury incident rate reduction. The first was supervisory involvement through increased visibility and participation in the safety inspection process supported by increased safety management audits conducted by professional safety staff.

Supervisory team members using a 22-item checklist on an electronic form conducted weekly safety inspections. Supervisors assessed safe conditions, safe behaviors, and management related compliance such training qualifications, daily equipment checkout, and pre-task plan completion. Professional safety staff performed 15 question safety management audits using a smartphone with web-based application. Focus of the safety management audit included observed safe behaviors and program management compliance of onsite project leaders. The number of supervisor inspection and safety audits completed was the data point used to assess participation in the monitoring and measurement initiatives. These numbers were evaluated against past years' injury and incident performance.

To monitor and measure motor vehicle performance, TC Electric made the decision to install vehicle trackers, referred to as Fleet Safety Devices, into all company owned and leased

vehicles. The purpose of these devices was to monitor driver performance such as speed, hard braking or acceleration, and erratic maneuvering. This data collected produced weekly scorecards leaders used to review and discuss driver performance and behaviors. Through the presence of these devices, combined with the monitoring and reporting capabilities of the system, drivers were expected to be more aware of their driving habits. Data produced was analyzed for patterns of improvement amongst fleet drivers and also evaluated against past years' motor vehicle incident data.

Summary

TC Electric is a full service electrical contractor who since 2010 has experienced significant growth, with much occurring in construction contracting divisions. As TC Electric grew the company went from being a regional contractor working in and around the Minneapolis, to being a national contractor with projects throughout the Midwest and Southwest. While the company grew and the geographic footprint grew the centralized safety function remained largely the same, just as it had been since 2010 when TC Electric was less than half its current size and operating in much smaller area.

In the last three years overall safety performance of the company declined. Workers were reporting injuries at increased rates and at fault motor vehicle incidents were on the rise as well. In 2017 TC Electric leadership made the decision to restructure the safety department to meet the needs of today's larger company. The restructuring brought in a new safety director and two additional safety coordinators came aboard as well. With resources in the field to address day to day issues, the safety director working with leadership, identified supervisory involvement and performance monitoring as two areas that would lead to quick gains in terms of improved safety performance.

In early 2018 documented supervisory inspections of the worksite became mandatory complemented by safety staff performing safety management audits to very company safety management practices were implemented on the work site. Those combined efforts of monitoring and involvement resulted in 55 percent reduction of injuries reported, and 70 percent reduction in serious injuries reported compared to 2017 statistics. To address at fault vehicle incidents fleet safety devices were installed to monitor and report driver behavior using global positioning system technology. Supervisors used those reports to evaluate driver performance and feedback to drivers on their desired and undesired driving habits. Through August of 2018 vehicle incidents are down by 60 percent and with at fault vehicle incidents down 45 percent as compared to the same point in 2017. While some four months remained in 2018 early indications were that the increased engagement and performance monitoring of employee performance had the expected effect and 2018 statistical safety performance improved from the previous year.

Chapter II: Literature Review

In the realm of construction safety management, the concept of leadership engagement refers to the amount of involvement and ownership company leaders take in regard to how safety is managed and the safety performance results they produce. In other words, how committed is an organization and its leadership in terms of placing the health and wellbeing of the workforce above all other goals in the organization?

Most construction contractor companies today do place employee safety as the number one priority of their organization with varying degrees of effectiveness. This commitment to safety is demonstrated on posters and homepages in company core values and again in mission statements right beside commitments to quality, service, and customer satisfaction. While for many companies the morality of worker protection is reason enough for this level of commitment there are also business reasons for this as well.

Business Case for Safe Performance

Within the construction industry there are factors motivating contractor companies to improve safety performance, beyond moral responsibility to do so. Direct losses associated with injury incidents, equipment and property damage and vehicular incidents directly impact profitability and ultimately affects the ability of a company remain viable in the highly competitive construction industry (Abudayyeh, Fredericks, Butt, & Shaar, 2006).

According to the Bureau of Labor Statistics the construction industry accounts for 5% of the national workforce, but accountable for 19% of the annual workplace fatalities (Song, Awolusi, & Marks, 2017). In 2015 there were 924 construction worker fatalities and 199,600 non-fatal, but significant injuries that required medical intervention beyond first aid (Bureau of Labor Statistics, 2016). The combined cost of those construction industry injuries and fatalities

were estimated to $11.5 billion annually with an average direct cost per incident estimated as $27,000 (Waehrer, Dong, Miller, Haile, & Men, 2007).

In a journal article the author, Daniel Corcoran makes this observation; “As sales dissipate from loss of market share to well managed companies that have time to focus on the horizon, the true indirect costs incurred by accident-riddled companies become realized” (Corcoran, 2002). Construction companies cannot simply afford to absorb losses as the cost of doing business and leaders of today must commit time, energy, and resources towards safety management practices and culture to remain competitive.

Modern Safety Management

Modern safety management principles originated when the Occupational Safety & Health Administration (OSHA) was established under the Occupational Safety and Health Act of 1970. The Act required the Secretary of Labor to establish programs for education and training of employers and employees in recognizing, avoiding, and preventing unsafe conditions (OSHA, 2001). This guidance established rules for protecting workers from hazards, training, in some cases minimum qualifications and competency requirements (Hammer, 1989). Over time those same rules expanded to include employer guidance for occupational health exposures, incident and injury management requirements, and recordkeeping rules (MacLaury, 1981).

Establishing proper protocols can often be the difference between a safely completed job and an unfortunate loss. It is for that reason most client owners and major general contractors have moved to formally vetting contractors and subcontractors they allow to perform work for them or on their behalf. Contractor prequalification systems put focus on contractor performance history (Del Nero, 2014).

Management Commitment to Safety

Whether it be morality, profitability, regulations, client demands, or combination of all those factors, leaders of today are understanding the need to effectively implement and manage safety within their organizations. Safety as both practice and function was once viewed as overhead or a not adding value adding activity. Because the fiscal, regulatory, and even client penalties for not doing so are so severe in terms of lost profitability, fines, and potential loss of work, leaders are shifting towards development of safety functions as an investment to the company and research indicates it is paying off.

In a study evaluating the effects of management commitment to safety performance the main finding was construction companies that focus and dedicate resources necessary for developing programs and people to support strong safety culture outperform organizations that do not actively manage the safety process or that simply manage towards minimal regulatory compliance (Abudayyeh, Fredericks, Butt, & Shaar, 2006).

Even amongst organizations that can demonstrate management commitment through safety policy letters, availability of safety resources, safety related goals and objective, and so forth there are some that perform well, while others achieve exemplary levels of safety performance. The reason for this is most likely leadership engagement (Haight, 2008). Resources and proclamations can be helpful, but they are no substitute for leaders who are actively involved, are visible proponents for safety and hold themselves accountable for performance and include safety as a key performance indicator of business performance (Haight, 2008).

Leader driven safety culture is not new. In what is often described as one of the best safety speeches every made, Paul O'Neil, Former Treasury Secretary and Former CEO of Alcoa in his very first address to Alcoa stockholders opened with this:

> I want to talk to you about worker safety… I'm not certain you heard me. If you want to understand how Alcoa is doing, you need to look at our workplace safety figures. If we bring our injury rates down, it won't be because of cheerleading or the nonsense you sometimes hear from other CEOs. It will be because the individuals at this company have agreed to become part of something important: They've devoted themselves to creating a habit of excellence. Safety will be an indicator that we're making progress in changing our habits across the entire institution. That's how we should be judged. (Claire-Ross, 2012)

Safety Performance Measurement

Performance measurement in safety can be broken down into three basic areas; lagging indicators, current indicators, and leading indicators. Lagging are measures of what has happened. Examples of lagging indicators include injury & incident rates. Current indicators examples include the number or quality of inspections and audits conducted up to a specified period of time. Leading indicators are measures that potentially reflect future safety performance. Examples of leading indicators are the percentage of workforce trained in glove use as measure of hand injury potential or leadership involvement in field audit inspection and programs (Haight, 2008)

While Haight is clear in how safety indicator types differentiate and how they are used there are some differing opinions. Fred Manuele in his book, On the Practice of Safety, indicates there is not universal agreement within the safety profession on what is or is not a leading

indicator. Manuele (2013) continues with that while leading indicator data may indeed be collected the data is not necessarily of sufficient quantity or quality either making it not actionable or drawing false conclusions based on perceived correlations (Manuele, 2013).

Audits & Inspections

One area that may be used to assess supervisory and leadership engagement is through documented participation in the safety audition and inspection programs. At every level of participation there added benefits to the safety culture. At the lower level, a supervisory participating in scheduled inspection accomplished two things. The first is the supervisory taking some time to walk his or her site with safety as the focal point. It is the opportunity to ensure workers are meeting performance expectations, engage workers in conversation, solicit ideas about what is effective and even what could be done better. Often leaders are not the most knowledgeable person on site when it comes to process related risks and controls, by engaging the front-line worker valuable insight is gained and most workers are eager to share that insight when asked.

The next levels of participation are project management team members. These are the engineers, construction managers, and junior executives. This group of professionals are responsible for bidding and estimating work, designing, project planning, and of course project execution. The value in this group participating in the audit and inspection processes is to assess worker behaviors and work environment conditions with a focus on safety. It is also an opportunity for the management team to reaffirm with site supervision company and client expectations regarding safety performance. The most valuable aspect of their presence is the opportunity to understand more clearly the work the estimate, bid, design, and manage. Through

this, leaders garner valuable insight on how work is done, how effective project planning can lend itself to safer, and more efficient execution.

Executive leadership presence and engagement is invaluable. When senior leaders make time to put safety a top of all else it establishes tone, establishes culture, and makes it very clear that subordinate leaders are expected to do the same (Hersman, 2018). The impacts of executive engagement to front line supervision and the workforce in general should not be understated. A senior leader onsite expressing appreciation directly for safe work

Fleet Telematics

Another opportunity for employers to impact safety performance of the organization is through fleet management practices that include the use of technology to both monitor and influence safe driving behavior drivers. The primary method of monitoring driver behavior is with telematics. Telematics refers to vehicle GPS systems using wireless technology to track and navigate vehicles. (Center for Insurance Policy and Research, 2018) A typical telematics system is composed of computing devices, computer networks and telecommunications infrastructure. Computing technology processes data, networks are used to communicate with remote devices installed in fleet vehicles, the communication system used to facilitate communication between the device and end user computer who are monitoring incoming data.

The benefits of fleet telematics are numerous. Related safety telematics are used to monitor driver behaviors related to speeding, hard braking and hard acceleration, erratic cornering, and more. It is through fleet telematics that supervisors and managers have an opportunity to observe and influence driver behaviors through data reported to them through driver scorecards or even have the option of monitoring driver behavior in real time. In a 2015 Insurance Journal article over 56% of respondents to a public opinion survey indicated that the

presence of a telematics device on their vehicle made changes in how they drive (Insurance Research Council, 2015).

Like benefits achieved on worksites where workers know safe performance is an expectation, when leaders actively involved in fleet safety the impacts are development of safer driving habits; thus, reducing the likelihood or loss due to vehicle related injury of incident. In a 2000 study, researchers found that drivers operating fleet vehicles equipped with behavior monitoring devices were 20% less likely to be in involved in a motor vehicle accident (Wouters & Bos, 2000).

Safety is one benefit of fleet telematics; another benefit is asset protection. Fleet vehicles are expensive investments. Depending on the size of the fleet and types of vehicles, organizations spend hundreds of thousands of dollars or more to maintain fleets. Fleet telematics can help fleet managers monitor vehicle health, track and help schedule preventative maintenance, and track the asset to ensure the vehicle use is in accordance with company policy and is helpful for tracking in the event of vehicle theft.

One of the concerns related to fleet telematics is privacy. Many people are concerned with employers having the ability to track location through the fleet telematics device. In some cases the concerns are minimal where a service or route delivery drivers concerns are minimal compared to management team members' assigned vehicle as a company benefit or perk. The more latitude a person has using the company vehicle for personal use the greater the privacy concern. To overcome this obstacle companies are becoming more restrictive in their personal use policies, or they restrict the type of data being analyzed and reported on.

Summary

Generally, most major construction contractors have established safety programs and within them policies that comply with OSHA and other regulatory guidelines. However, incidents still occur and are often a result of not adhering to their established safety procedures whether it is regulatory or company standards demonstrating that simply having these programs in place is insufficient to ensure a successful safety program. Reese suggests that three conditions must exist; "management commitment and leadership, safe working conditions, and safe work habits by all employees (Reese & Eidson, 1999)." In other words, to be successful in development of safety programs and instilling sustainable safety culture an organization needs participation of both managers and workers.

Ultimately the success or failure of an organizational safety efforts rests directly on the amount of oversight, effort and participation of the organization top leaders. When top leaders take the time to be actively engaged and hold themselves and the subordinate members of the leadership group accountable for safety performance an organization will begin to realize the benefits of the improved safety culture. This culture cascades downward through the middle management and supervisory ranks and to the front-line workers.

One way of impacting organizational safety performance is by monitoring and measuring worker behavior and performance through effective supervisory observational and inspection programs. The value in these programs is twofold. First, the actual inspection of observation is comparing level of compliance against predetermined criteria to determine if workers are demonstrating an acceptable level of performance. The second benefit is the focus required of the supervisory or manager conducting the inspection or observation and the opportunity to establish dialogue with workers through positive discussions centered on safe performance.

Asking a worker to be compliant with a safety rule will occur on occasion, but majority of interaction with workers is positive and reinforces the observed safe behaviors you expect.

Chapter III: Methodology

TC Electric is a large scale commercial electrical contractor performing work throughout the United States. Because of growth, expanded lines of services, and the larger geographic footprint maintaining and providing oversight to a workforce of qualified electrical workers became more challenging than when TC Electric operations were more focused around the Minneapolis, MN area. The headquarters based, and centralized safety function is neither staffed nor structured to provide consistent oversight and support at all locations where work is being performed.

At the end of 2017 company leadership concluded that the company was not performing satisfactorily in terms of safety. For three consecutive years, total number of injury incidents, injury incident severity, and losses associated with at fault motor vehicle incidents were all trending higher and statistically safety performance was falling short of company and client goals. For TC Electric to perform to company and client expectations safety performance needed to be monitored, measured, and reported the company necessitated getting more members of the leadership and supervisory team involved and engaged in safety management.

In January 2018 TC Electric leadership team identified two key areas the company would focus on to improve performance. The first area was reduction of injury incidents in terms of frequency and severity rates through increased supervisory involvement on the job site, the premise was that supervisors actively participating in the safety oversight and accountable for their safety performance would lead to statistical reduction of injury rates.

The injury data collection process was already developed and had been in place for several years. The comparative metric would be the number of supervisory safety inspections and safety audits performed. The second area of performance improvement would be reduction

in the number and severity of company motor vehicle incidents. Like injury incident statistics, the motor vehicle incident data collection process was already in place. The comparative metric would be the installation and monitoring of fleet safety monitoring devices into fleet vehicles and effects those devices. The incident data collection table is shown in Figure 1.

2018	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
OSHA REC												
OSHA CULM												
GOAL RATE < 1.0												
ALL INJ												
Req Off Site Med												
ALL INJ CULM 2018												
HOURS												
CULM HOURS 2018												
OSHA RATE												
ALL INJ RATE												
2017												
OSHA REC												
OSHA CULM												
GOAL RATE < 1.0												
ALL INJ												
ALL INJ CULM 2017												
HOURS												
CULM HOURS 2017												
OSHA RATE 2017												
ALL INJ RATE												
FLEET 2018												
ASSIGNED FLEET												
FLEET CULM												
AT FAULT												
AT FAULT CULM												
GOAL < 3% AT FAULT												
AT FAULT %												
OTHER WAY												
FLEET 2018												
ASSIGNED FLEET												
FLEET CULM												
AT FAULT												
AT FAULT CULM												
GOAL < 3% AT FAULT												
AT FAULT %												
OTHER WAY												

Figure 1. Example incident data collection chart.

Injury Data Collection

The first step in the TC Electric injury data collection process was the foreman or field supervisor initial report of injury. Typically reports were called in to the safety department by the field supervisor telephonically immediately following an injury incident. The safety department would collect essential identifier information such as who was injured or involved,

location, the type and severity of the injury and assist the supervisor in coordinating appropriate medical care off the work site when necessary. In the event an injury believed to be significant the field supervisor would notify emergency medical services before calling in to the safety department.

After the initial notifications were made and the injured worker received the appropriate treatment for the injury an incident investigation occurred. The field supervisor completed supervisor initial incident report, took pictures, secured witness statements and related information the injury was logged into spreadsheet. Investigation, facilitated by the safety department, would conclude with incident root cause analysis and in the event of a significant injury or an incident that had high potential for significant injury a senior leadership review meeting was held with members of the project management team accountable for the incident. The incident review meeting was facilitated by the safety department with the focus of identification of any managerial or process related issues that may have contributed to the incident and developing actionable corrective actions that would reduce potential for recurrence of similar events in the future.

The data generated through the incident reporting and investigation processes was maintained in the company injury log. The injury log tracked each injury event which was used to generate reporting data on the frequency of incidents, nature of injury, mechanism of injury. This data was tracked and reported monthly in company safety performance metrics. Metrics were used to provide company leaders and management teams weekly updates on organizational and business unit safety performance. Figure 2 displays examples of organizational performance data reported monthly.

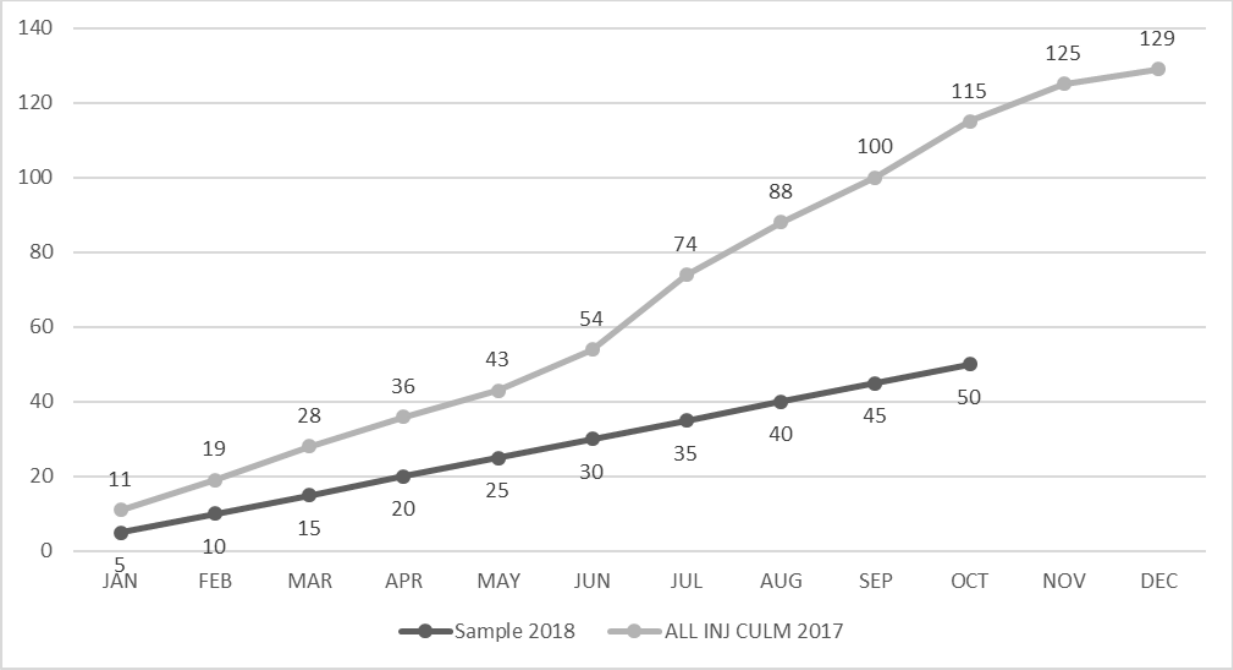

Figure 2. Incident and rate chart with sample 2018 data.

Safety Inspection and Audit Data Collection

Safety inspections and audits were collected by operations coordinators and tracked in a spreadsheet that reflected monthly completions by field supervisors and management team members. Completion of safety inspections and audits was determined to be a measurable metric that represented leadership presence and engagement in the field. Completion of supervisor safety inspections and management audits is reported as a weekly metric both at organizational and division levels. Figure 3 is an example to the weekly inspection completion metric.

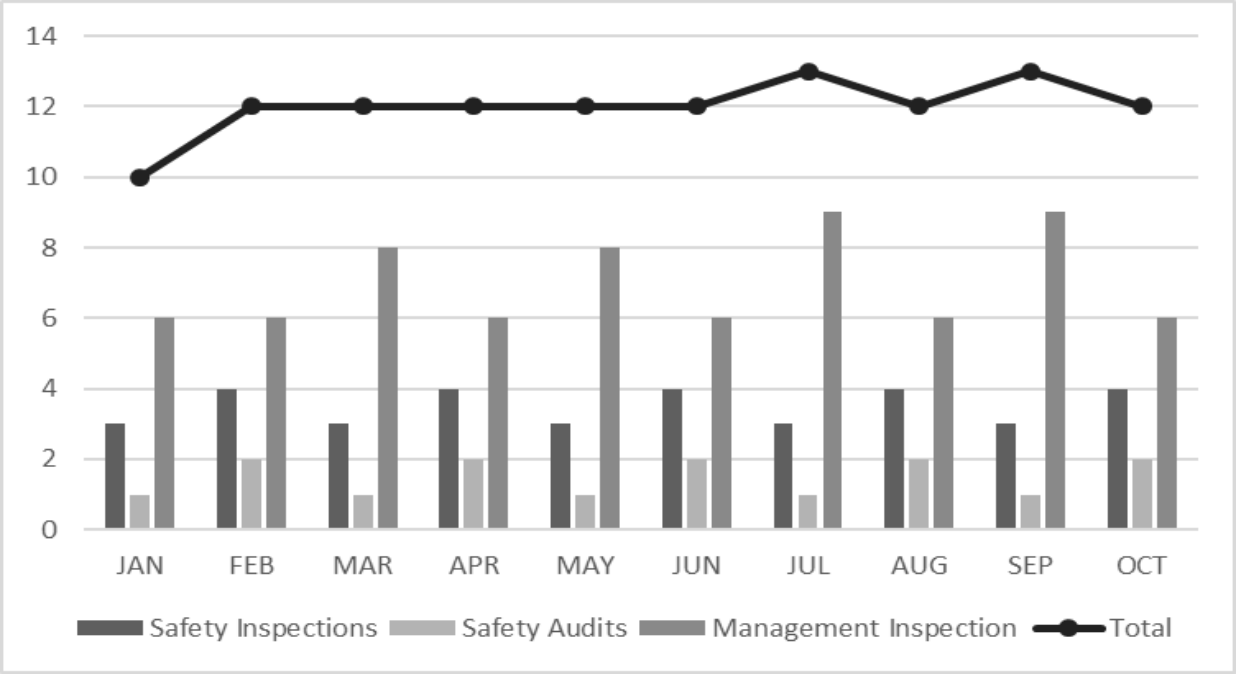

Figure 3. Monthly inspection completion metric with sample data.

Motor Vehicle Incident Data Collection

Motor vehicle incident data was reported through much the same process as injury reporting. Each vehicle had been furnished with an accident reporting card with specific reporting procedures for the geographic location to which the vehicle is assigned. The card provided space for basic incident data collection, insurance policy information, and vehicle service and towing contacts were also included. The card also provided specific procedures on who to notify in the event of an accident and provided basic instructions on what our drivers should do in the event of an accident.

Typically, the safety department was contacted by the driver directly or by the supervisor or manager of the driver. After verifying no injuries, safety department collects basic information on the incident, information on weather and traffic conditions, and ideally name and badge number of the responding law enforcement official needed to obtain a copy of the accident report. After the incident was reported and logged, safety department determined if accident was

fault of the company driver or not. For most highway incidents where law enforcement was summoned fault is determined by investigating officer and annotated on the accident report from the law enforcement agency.

In instances where law enforcement was not contacted or unable to be at the scene, at fault determination was based on the circumstances of the accident as reflected through vehicle damage and driver statement. In most instances these were low speed parking lot fender benders. All single vehicle accidents involving company drivers are considered at fault except for wildlife related accidents such as a deer or bird strike. Damages found and reported such as damage to a parked company vehicle were not determined to be at fault if the vehicle was parked in a safe, approved location. Figure 4 depicts example of monthly metric based on at fault incidents compared to 2017.

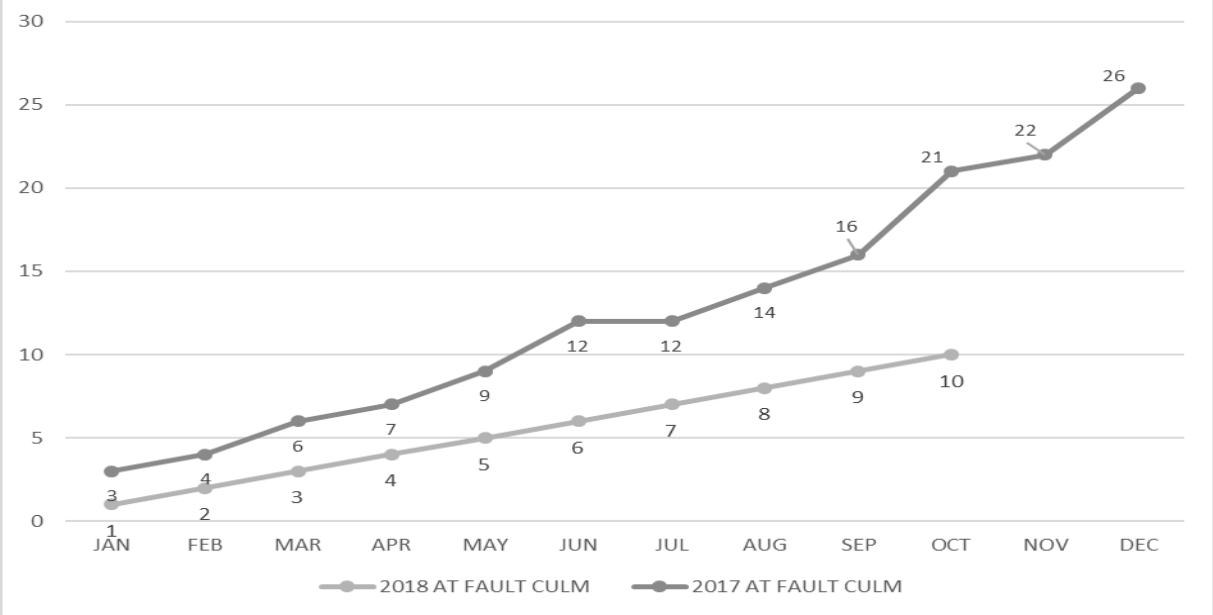

Figure 4. Preventable vehicle incident metric example.

Driver Performance Data Collection

The fleet safety devices installed in fleet vehicles provided monitoring and real time reporting capability on spectrum of data related to vehicle use, location, driver performance, and

driver behaviors. The devices and the reporting function was through a third-party vendor called Geotab that specializes in telematics using global positioning system for fleet management and vehicle tracking. The devices collected and reported data directly to a company administrator with ability to monitor any or all drivers in real time via desktop computer. The data collected was wide ranging. Types of data collected from vehicles equipped with fleet safety devices included fuel usage, engine performance and faults, trailer towing, vehicle location using mapping technology, and driver performance data that was the primary focus of the study.

Driver performance and driver behaviors that were monitored and measured included; speeding with four categories of compliance, harsh events such as hard braking or acceleration, accident reporting, and seat belt use. Additionally, it reported mileage driven. Leadership reports and driver report cards were generated monthly and distributed. The report cards rated drivers on performance and behaviors using a point system. Drivers were scored into four categories based on overall performance over one-month periods. The categories were Exceeds, Meets, Under Performing, Significantly Under Performing. Figure 5 is an example of the monthly metric for driver performance and behavior used by supervisors and management to monitor performance.

TC Electric

Risk Management Report			
From		Distance Unit	miles
To		Speed Unit	mph
Behavior	Weight		
>15mph	7		
9mph to 14.9mph	4		
5mph to 8.9mph	1		
Harsh Events	4		
Possible Accident	10		
Seat Belt	10		

Performance Classification	Performance Score
Exceeds	90
Meets	75
Below	60
Far Below	0

How is my score calculated?

Your driver score is calculated based on the number of exception events per 100 miles of travel. Each behavior type is assigned a demerit weight. The totals for each type of exception are outlined for your review below.

Driver	Group	Risk	Month	Total Distance	Total Events	Events/100 Miles	Score	>15mph	9mph to 14.9mph	5mph to 8.9mph	Harsh Events	Possible Accident	Seat Belt	>15mph	9mph to 14.9mph	5mph to 8.9mph	Harsh Events	Possible Accident	Seat Belt
DRIVER-001																			
DRIVER-002																			
DRIVER-003																			
DRIVER-004																			
DRIVER-005																			
DRIVER-006																			
DRIVER-007																			
DRIVER-008																			
DRIVER-009																			
DRIVER-010																			
DRIVER-011																			
DRIVER-012																			
DRIVER-013																			
DRIVER-014																			
DRIVER-015																			
DRIVER-016																			
DRIVER-017																			
DRIVER-018																			
DRIVER-019																			
DRIVER-020																			
DRIVER-021																			

Figure 5. Driver performance monthly metric example.

Summary

Introduction of leading indicators such as supervisor inspection and driver performance metrics were the mechanisms by which leadership would positively impact the lagging indicators that included injury rates and at fault motor vehicle incidents. Data collection procedures for injury and incident were already in place at TC Electric and that data indicated performance was not to company or client standards. To address increased injury and incident rates leadership-initiated efforts to increase the level of management and supervisory involvement and

engagement on the work sites. As a measurable metric the number of site inspections and audits conducted were selected as the indicator to evaluate the amount time managers and supervisors were spending on site.

Like injury and incident data, motor vehicle incident collection processes were already in place at TC Electric. The data reflected fleet motor vehicle incidents and related costs were increasing and needed to improve. To address motor vehicle incident performance TC Electric leadership chose to implement a fleet telematics program focused at monitoring driver behavior and influencing safer driver behavior through coaching and mentoring based on telematic data.

Both the injury and the motor vehicle incident improvement initiatives were selected because TC Electric had existing data collection processes in place. With the data already collected leadership agreed that these areas be impacted quickly with measurable countermeasures put in place. It was the expectation of this study that increased leader engagement and associated focus in incident prevention would positively impact injury and motor vehicle incident trends.

Chapter IV: Results

The outcome of this study was improved statistical safety performance. This was accomplished through increased supervisory and management engagement, along with systematic monitoring and measurement of worker safety and driver performance. The benefits of supervisory involvement and safety performance monitoring and measurement were safer work sites, reduction in incident and issue frequency. Improvements in safety performance resulted in TC Electric building stronger relationships with clients and general contractors.

The problem at TC Electric was company had experienced significant growth in the last decade without making commensurate expansions of the safety department nor had TC Electric changed how safety was structured within the organization. Since 2016 the safety organization and the safety management practices of TC Electric were ineffective in supporting the organizational goals related to safety performance. Metrics related to safety performance for 2016 and 2017 reflected negative trends in the number of safety incidents incurred. TC Electric saw similar negative trends in motor vehicle incidents during the same period.

TC Electric leadership team selected injury incident frequency reduction and motor vehicle incident frequency reduction as 2018 safety improvement initiatives. Injury reduction objectives were to reduce the number of injury incidents from 2017 data by thirty-five percent and maintain a total-recorded-injury-rate of less than 1.0. Total recorded injury rate was calculated by multiplying number of injuries greater than first aid care by 200,000 man-hours divided by actual number of man-hours worked. Motor vehicle incident reduction goal was also set thirty-five percent. The injury and vehicle incident data collection processes had been in place for several years. Incident data collection spreadsheet is shown in Figure 6. Within Figure

6, OSHA RATE and ALL INJ RATE rows reflect impacts of this study through lower injury rates with 2018 compared to the same data from 2017.

2018	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
OSHA REC	1	0	0	0	0	0	0	2	1	1		
OSHA CULM	1	1	1	1	1	1	1	3	4	5	5	5
GOAL RATE < 1.0	1	1	1	1	1	1	1	1	1	1	1	1
ALL INJ	7	10	3	8	2	2	5	6	3	3		
Req Off Site Med	4	5	1	8	0	0	1	1	1	1		
ALL INJ CULM 2018	7	17	20	28	30	32	37	43	46	49	49	49
HOURS	152,378.35	131,228.59	135,436.05	133,923.25	170,756.85	141,255.00	137,713.49	195,453.08	194,253.00	97,916.00		
CULM HOURS 2018	152,378.35	283,606.94	419,042.99	552,966.24	723,723.09	864,978.09	1,002,691.58	1,198,144.66	1,392,397.66	1,490,313.66	1,490,313.66	1,490,313.66
OSHA RATE	1.31	0.71	0.48	0.36	0.28	0.23	0.20	0.50	0.57	0.67		
ALL INJ RATE	9.19	11.99	9.55	10.13	8.29	7.40	7.38	7.18	6.61	6.58	6.58	6.58
2017	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
OSHA REC	1	3	0	0	2	4	2	1	3	3	2	0
OSHA CULM	1	4	4	4	6	10	12	13	16	19	21	21
GOAL RATE < 1.0	1	1	1	1	1	1	1	1	1	1	1	1
ALL INJ	11	8	9	8	7	11	20	14	12	15	10	4
ALL INJ CULM 2017	11	19	28	36	43	54	74	88	100	115	125	129
HOURS	118,807	133,354	173,791	148,487	166,953	216,590	175,578	240,357	187,044	186,314	205,492	158,899
CULM HOURS 2017	118,807	252,161	425,952	574,440	741,393	957,982	1,133,560	1,373,917	1,560,961	1,747,275	1,952,767	2,111,666
OSHA RATE 2017	1.68	3.17	1.88	1.39	1.62	2.09	2.12	1.89	2.05	2.17	2.15	1.99
ALL INJ RATE	18.52	15.07	13.15	12.53	11.60	11.27	13.06	12.81	12.81	13.16	12.80	12.22
FLEET 2018	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
ASSIGNED FLEET	34	34	35	34	34	35	34	34	35	34	34	35
FLEET CULM	34	68	103	137	171	206	240	274	309	343	377	412
AT FAULT	2	3	0	4	3	2	1	0	0	1		
AT FAULT CULM	2	5	5	9	12	14	15	15	15	16		
GOAL < 3% AT FAULT	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%		
AT FAULT %	5.9%	7.4%	4.9%	6.6%	7.0%	6.8%	6.3%	5.5%	4.9%	4.7%		
OTHER WAY	0.5%	1.2%	1.2%	2.2%	2.9%	3.4%	3.6%	3.6%	3.6%	3.9%		

Figure 6. Incident data collection spreadsheet.

Injury Data Collection

To compile injury incident data the safety department used the existing TC Electric injury reporting process. Initial reports of injury were submitted to the safety department by the field supervisor telephonically immediately following an injury incident. Information from this report was entered in an injury log with essential identifier information such as who was injured or involved, location, the type and severity of the injury. Safety department completed investigation and facilitated root cause analysis during which time the injury and treatment

classification decisions were made. Injuries were classified in descending order of severity; days away / lost time, restricted duty, medical aid, first aid. The first three classifications were used to calculate recorded injury rate while all four classifications are used to compute reported injury incidents. Figure 7 displays the comparative reported injury data for 2017 and 2018 through October.

While total hours worked in 2017 and 2018 are near identical the frequency of injury incidents in 2018 declined by 57 percent. There were 50 injuries reported through the October period in 2018 compared to 115 injury incidents reported through the same period in 2017.

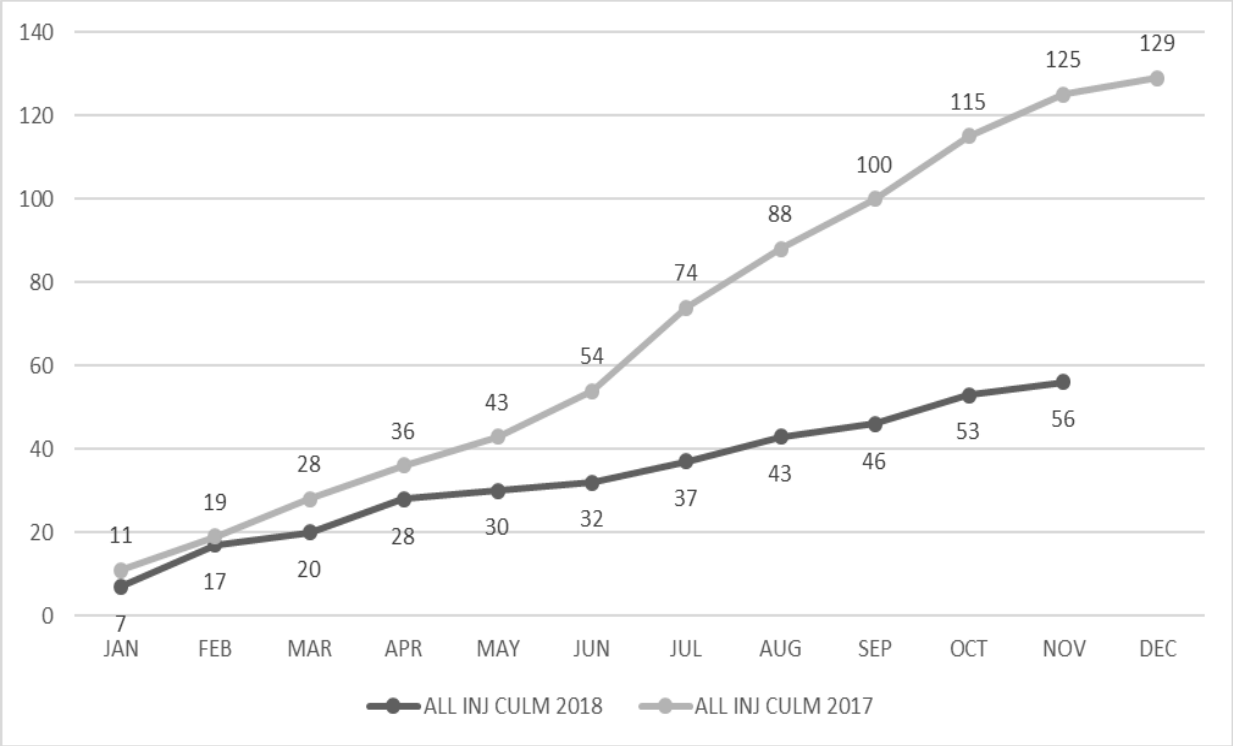

Figure 7. Reported injury incidents 2017 – 2018.

Safety Inspection and Audit Data Collection

Safety inspections and audits data collection and analysis was a new metric for 2018. Limited inspections and audits were conducted previously but were not mandatory nor was data collected and analyzed. Based on reviews of paper and scanned inspection forms that were

available the 2017 completion estimate is that fewer than 100 supervisory inspections or audits were conducted. Safety inspection and audit completions were determined to be a measurable metric to represent the level of supervisor and manager presence in the field. In 2018 a total of 624 verified visits to the field were documented through completion of 326 supervisory safety inspections, 202 safety audits, 96 management inspections through October. Figure 8 inspection completion metric by month.

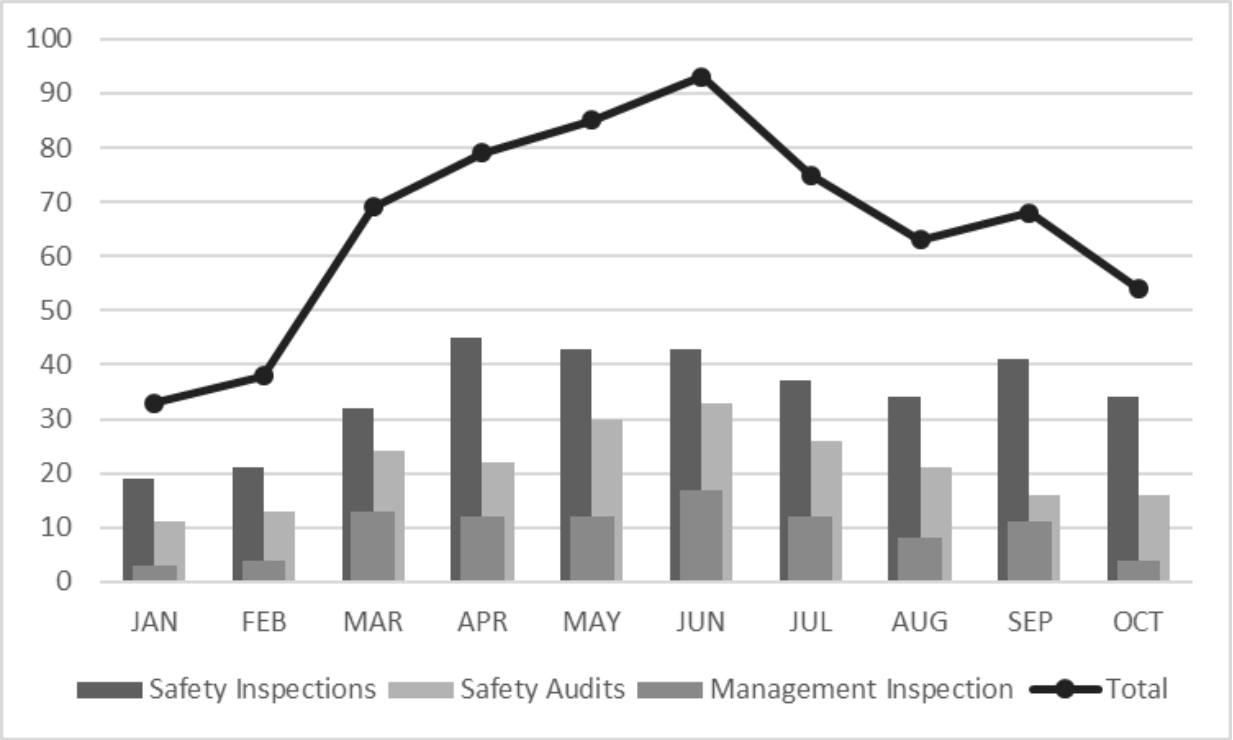

Figure 8. Inspection and audit metric Jan – Oct 2018.

Motor Vehicle Incident Data Collection

Motor vehicle incident data was reported through much the same process as injury reporting. Each vehicle had been furnished with an accident reporting card with specific reporting procedures for the geographic location to which the vehicle is assigned. The card provided space for basic incident data collection, insurance policy information, and vehicle service and towing contacts were also included. The card also provided specific procedures on

who to notify in the event of an accident and provided basic instructions on what our drivers should do in the event of an accident.

Vehicle incident reporting was initiated when the safety department was contacted by the driver directly or by the supervisor or manager of the driver. After verifying no injuries, safety department collects basic information on the incident, information on weather and traffic conditions, and ideally name and badge number of the responding law enforcement official needed to obtain a copy of the accident report. After the incident was reported and logged, safety department determined if accident was fault of the company driver or not. For most highway incidents where law enforcement was summoned fault was determined by investigating officer and reflected on the accident report from the law enforcement agency.

In instances where law enforcement was not contacted or unable to be at the scene, at fault determination was based on the circumstances of the accident as reflected through vehicle damage and conveyed via driver and witness statements. In most instances these were low speed parking lot fender benders. All single vehicle accidents involving company drivers were considered at fault except for wildlife related accidents such as a deer or bird strike. Damages found and reported such as damage to a parked company vehicle were not determined to be at fault if the vehicle was parked in a safe, approved location. Figure 9 charts 2017 and 2018 at fault motor vehicle incident results.

Fleet safety device installation was initiated in May 2018 and complete by July of 2018 in all 413 fleet vehicles. By October of 2018 data began to reflect a leveling off of at fault motor vehicle trends and a 25 percent reduction in at fault motor vehicle incidents compared to the same period in 2017. Through October 2018 TC Electric had incurred 16 such incidents

compared to 21 at the same point in time in 2017. The arrow on Figure 9 represents the start of fleet safety device installation in 2018.

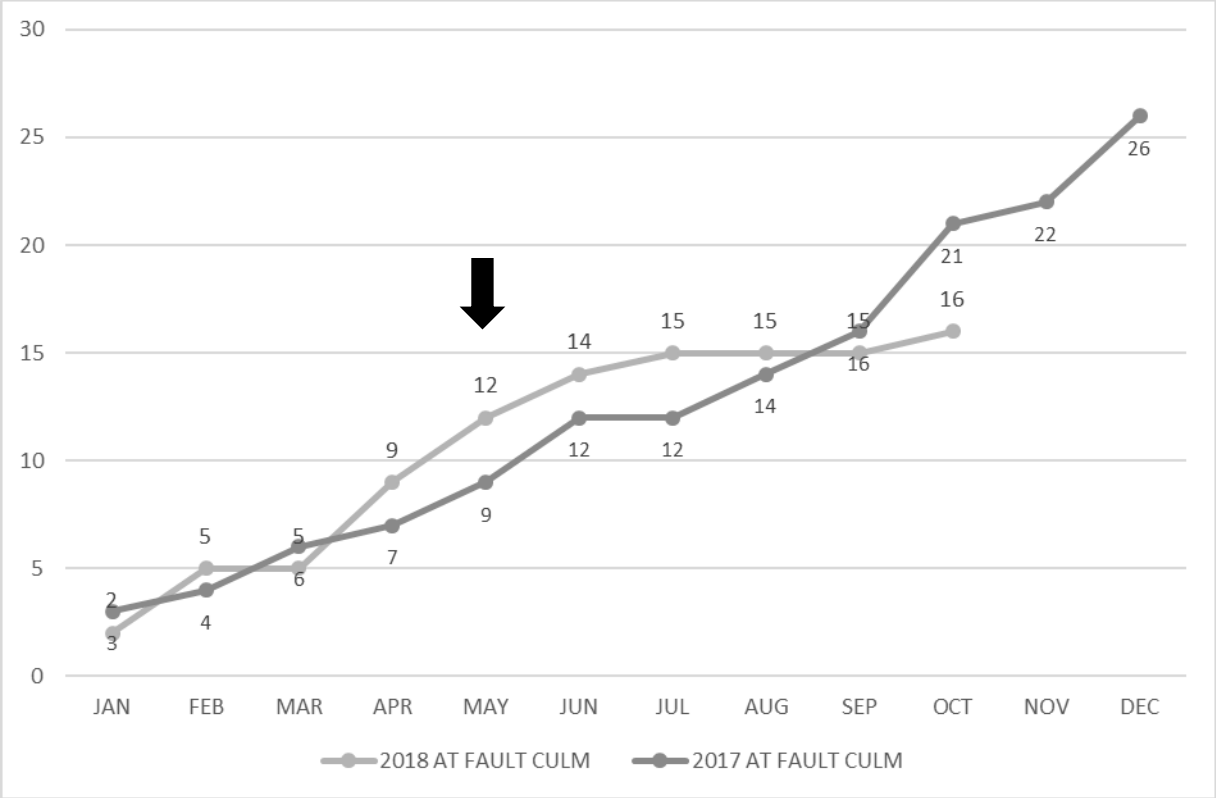

Figure 9. Preventable vehicle incidents, 2017 - 2018.

Driver Performance Data Collection

The fleet safety devices installed in fleet vehicles provided monitoring and real time reporting capability on spectrum of data related to vehicle use, location, driver performance, and driver behaviors. The devices and the reporting function was through a third-party vendor called Geotab that specializes in telematics using global positioning system for fleet management and vehicle tracking. The devices collected and reported data directly to a company administrator with ability to monitor any or all drivers in real time via desktop computer. The data collected was wide ranging. Types of data collected from vehicles equipped with fleet safety devices

included fuel usage, engine performance and faults, trailer towing, vehicle location using mapping technology, and driver performance data that was the primary focus of the study.

Driver performance and driver behaviors that were monitored and measured included; speeding with four categories of compliance, harsh events such as hard braking or acceleration, accident reporting, and seat belt use. Additionally, it reported mileage driven. Leadership reports and driver report cards were generated monthly and distributed. The report cards rated drivers on performance and behaviors using a point system Drivers were scored into four categories based on overall performance over one-month periods. The categories were Exceeds, Meets, Under Performing, Significantly Under Performing. Figure 10 is an example of the monthly metric for driver performance and behavior used by supervisors and management to monitor performance.

Driver score was calculated based on the number of exception events per 100 miles of travel. Each behavior type was assigned a demerit weight. The totals for each type of exception are outlined for each employee to review with supervisor or manager. The formal employee procedure was still under development, but expectation was that supervisors and managers who have drivers identified as under-performing or way under-performing would be subject to the normal TC Electric safety infraction process. The first step of the infraction process was documented verbal meaning the improvement conversation was logged, the next step was written warning. In circumstances where the employee was unable or unwilling to demonstrate compliance with a safety standard the employee was subject to reassignment or termination.

TC Electric

Risk Management Report

From		**Distance Unit**	miles
To		**Speed Unit**	mph

Performance Classification	Performance Score
Exceeds	90
Meets	75
Below	60
Far Below	0

Your driver score is calculated based on the number of exception events per 100 miles of travel. Each behavior type is assigned a demerit weight. The totals for each type of

Behavior	Weight
>15mph	7
9mph to 14.9mph	4
5mph to 8.9mph	1
Harsh Events	4
Possible Accident	10
Seat Belt	10

Driver	Group	Risk	Month	Total Distance	Total Events	Events/100 Miles	Score	>15mph	9mph to 14.9mph	5mph to 8.9mph	Harsh Events	Possible Accident	Seat Belt	>15mph	9mph to 14.9mph	5mph to 8.9mph	Harsh Events	Possible Accident	Seat Belt
DRIVER-001	TC Tech - Field	Meets	September	882	106	12	88	7	24	65	0	0	10	1	6	65	0	0	1
DRIVER-002	GVMN	Exceeds	September	1775	20	1	99	0	0	16	4	0	0	0	0	16	1	0	0
DRIVER-003	TC Service - Electrical (Office)	Under Performing	September	2744	796	29	71	49	528	199	20	0	0	7	132	199	5	0	0
DRIVER-004	GVMN	Exceeds	September	2807	256	9	91	0	28	228	0	0	0	0	7	228	0	0	0
DRIVER-005	ROMN	Way Under Performing	September	1426	824	58	42	84	600	86	4	0	50	12	150	86	1	0	5
DRIVER-006	ND - T&D [1165]	Meets	September	414	68	16	84	0	4	4	0	0	60	0	1	4	0	0	6
DRIVER-007	TC Service - Electrical (Field)	Under Performing	September	1650	390	24	76	14	112	164	0	0	100	2	28	164	0	0	10
DRIVER-008	Petro - Field	Exceeds	September	7	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0
DRIVER-009	TC Service - Electrical (Field)	Exceeds	September	1149	95	8	92	14	32	49	0	0	0	2	8	49	0	0	0
DRIVER-010	Northern MN	Exceeds	September	1324	58	4	96	49	4	5	0	0	0	7	1	5	0	0	0
DRIVER-011	GVMN	Exceeds	September	4102	140	3	97	14	20	102	4	0	0	2	5	102	1	0	0
DRIVER-012	ND - Technologies [1300's]	Exceeds	September	743	34	5	95	0	24	10	0	0	0	0	6	10	0	0	0
DRIVER-013	TC Service - Electrical (Office)	Exceeds	September	2783	187	7	93	35	80	52	20	0	0	5	20	52	5	0	0
DRIVER-014	Northern MN	Exceeds	September	815	48	6	94	28	4	12	4	0	0	4	1	12	1	0	0
DRIVER-015	Northern MN	Meets	September	3573	664	19	81	70	312	228	24	0	30	10	78	228	6	0	3
DRIVER-016	GVMN	Meets	September	756	78	10	90	0	24	46	8	0	0	0	6	46	2	0	0
DRIVER-017	TC Service - Electrical (Field)	Meets	September	1466	220	15	85	56	80	64	20	0	0	8	20	64	5	0	0
DRIVER-018	TC - Construction - Office [1100's]	Meets	September	2511	270	11	89	70	104	80	16	0	0	10	26	80	4	0	0
DRIVER-019	ND - Construction [1100's]	Exceeds	September	979	65	7	93	0	20	41	4	0	0	0	5	41	1	0	0
DRIVER-020	TC Service - Electrical (Field)	Exceeds	September	368	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0
DRIVER-021	TC Service - Electrical (Field)	Way Under Performing	September	1985	1072	54	46	0	872	192	8	0	0	0	218	192	2	0	0
DRIVER-022	TC - Construction - Office [1100's]	Meets	September	2813	384	14	86	21	148	203	12	0	0	3	37	203	3	0	0
DRIVER-023	TC Tech - Field	Under Performing	September	1292	318	25	75	7	148	159	4	0	0	1	37	159	1	0	0
DRIVER-024	TC Service - Electrical (Field)	Exceeds	September	829	11	1	99	7	0	0	4	0	0	1	0	0	1	0	0
DRIVER-025	Northern MN	Meets	September	894	137	15	85	0	84	53	0	0	0	0	21	53	0	0	0

Figure 10. Driver performance monthly metric report.

Summary

Introduction of leading indicators such as supervisor inspection and driver performance metrics positively impacted the TC Electric safety performance lagging indicators of injury frequency and at fault motor vehicle incident frequency. Leadership efforts to increase the level of management and supervisory involvement and engagement on the work sites definitively influenced worker behavior and resulted in 57 percent reduction in work site injury reports.

While other factors certainly impacted that level of success such as the site leader being involved in task planning and increased general oversight the measurable metric to determine leader presence was the number of site inspections and audits conducted.

The at fault motor vehicle data also reflects the added involvement of leadership combined with the ability to monitor driver performance using telematics fleet safety devices also had positive impact on safety performance. While the data period after telematics installation was a narrow three-month period the early overall frequency of motor vehicle incidents is down by 25 percent from 2017 through October.

Both the injury and the motor vehicle incident improvement initiatives were selected because TC Electric had existing data collection processes in place could be impacted quickly with measurable countermeasures put in place. The data supports that increased leader engagement and associated focus in incident prevention positively impacted injury and motor vehicle incident trends.

Chapter V: Discussion, Conclusion and Recommendation

This study was developed to improve statistical safety performance through increased supervisory and management engagement, along with systematic monitoring and measurement of worker safety and driver performance. Since 2015 safety performance had declined to substandard levels and company leadership was concerned degraded safety performance and increased incident frequency would elevate the likelihood of more severe incidents and injuries. Substandard safety performance also jeopardized TC Electric by potentially rendering the company ineligible to work with key clients due to loss of confidence and more stringent contractor prequalification standard related to historical safety performance.

Chapter I presented historical background of TC Electric as growing full service commercial and industrial electrical and technology contractor based in Minneapolis, Minnesota. The chapter also described declining safety performance in recent years due in large part to the company growth and the failure of company leadership to advance safety management practices and avail resources to the safety department commensurate with the growth TC Electric realized. Additionally, Chapter I provided definition for key terms used in the study.

Chapter II was a review of literature that outlined the business case for a company being concerned with safe performance and described the origins of modern safety management principles. Chapter II literature review presented insight on measurement of safety performance, benefits of management commitment, and audit and inspection impacts. The chapter also described purpose and potential effects using telematics to management fleet programs to improve driver behaviors.

Chapter III worked through the methodologies used in the study to collect and assess data related to assessing the impacts of increased leader engagement had on safety performance in the

field. The chapter also detailed the processes used to implement and report driver behavior performance through the implementation of fleet telematics in company vehicles.

Chapter IV presented the data and the resulting statistical safety performance improvements realized through the implementation of leadership engagement opportunities with safety inspections and behavior auditing. The chapter also detailed fleet safety performance improvement achieved through the installation of fleet telematic devices and the subsequent supervisory engagements the occurred as result of the telematic driver scorecard process, Efforts to increase the level of management and supervisory engagement on the work sites resulted in 57 percent reduction in work site injury reports.

At fault motor vehicle data also reflected improvement. Monitored driver performance through telematic fleet safety devices combined with leadership engagement through use of the driver scorecard reporting process resulted in frequency of motor vehicle incidents declining by 25 percent compared to the 2017 data.

Both the injury and the motor vehicle incident improvement initiatives were selected because data collection processes were established. Because the historical data was available leadership determined measurable countermeasures could have immediate impact to company safety performance trends.

Limitations

Results of the fleet telematic study were reached using a relatively small window of data. The telematic fleet safety devices were not fully installed in company vehicles until May of 2019 though the installation of the devices began in February 2019. While the telematic data did impact behaviors of drivers it is likely that leadership focus on vehicle safety performance also

influenced the results as well. Prior to the fleet telematics installation there had not been a focus by leadership to improve in this area.

Leader and supervisory engagements were measured using only submitted safety inspections and audits to document leadership presence and engagement in the field. Leaders being present and performing safety inspections certainly impacted worker behavior, but this process does not completely document all leader activity in the field. Leadership focus on improving worker safety performance in the field also resulted in increased awareness across the organization. This resulted in improvements to task planning processes, implementation of incident review meetings, and emphasis on communications and project planning. These activities that were not measured likely played a significant role in the statistical safety improvements realized as a result of this study.

Conclusions

Leadership engagement and performance mearing and monitoring are essential to establishing, maintaining, and improving organizational safety culture. Through enhanced performance monitoring and communication processes, leaders were better informed and aware of emerging negative performance trends within the organization. Because this information was available, leaders were able to act and implement counter measures to improve performance in the current year to include the initiatives that were subject of this study.

While it is not necessary to measure and monitor all aspects of safety performance there is still a deficit in leading indicator monitoring. This study illustrated to TC Electric leadership that the skills and experience they have to manage other aspects of the business are equally effective when employed to improve safety performance. As noted in the limitation section of Chapter 5 there were other factors that were not measured but likely supported the improved

statistical safety performance realized through this study. While not readily measurable, leadership improved awareness of communications, need to more effective in task planning, and leader participation in project planning are all positive indicators that a leadership driven safety culture is emerging.

Recommendations

This study was an early step in the TC Electric safety improvement journey. Many of the challenges associated with accelerated company growth still exist. While steps have been taken to improve supervisory involvement and oversight and have improved safety performance there are opportunities for TC Electric to continue to improve the organizational safety culture and related processes.

Organizationally the safety department is a support function not directly reporting to executive or operational leadership. The lack of such a reporting structure means that safety is being managed from the side of the organization and there is not a direct relationship with divisional leaders or executive leaders. If the safety department were aligned under top leadership there could be more opportunity to engage leaders, participate in goal setting, and strategic planning.

Another related organizational challenge is that at TC Electric is organized centrically with each division operating with considerable autonomy. The safety function is being managed centrally as a corporate support function. The current structure and staffing of the safety department are not sufficient to ensure resource availability across all divisions.

Finally, TC Electric must consider upgrading enterprise software. Currently the organization uses at least five different and disconnected systems to manage workforce, training, safety, projects, planning, and scheduling. There others being used to manage procurement and

service functions. Impacts to safety is lack of ability to track or schedule employee training. Records of completed training are not retrievable by supervisors. Much of the professional safety staff time is used performing non-value adding administrative functions that would be non-existent if TC Electric utilized modern enterprise software.

References

Abudayyeh, O., Fredericks, T. K., Butt, S. E., & Shaar, A. (2006). An investigation of management commitment to construction safety. *International Journal of Project Management,* 167-174.

Bureau of Labor Statistics. (2016). *National census of fatal occupational injuries in 2015.* Washington, DC: Department of Labor.

Center for Insurance Policy and Research. (2018, July 26). *Usage based insurance and telematics.* Retrieved from https://www.naic.org/cipr_topics/topic_usage_based_ insurance.htm

Claire-Ross, M. (2012, September 25). *One of the best safety speeches ever by Alcoa CEO.* Retrieved from https://ehssafetynewsamerica.com/2012/09/25/one-of-the-best-safety-speeches-ever-by-a-ceo/

Corcoran, D. (2002, June). The hidden value of safety. *Occupational Safety & Health, 71*(6), 20-23.

Del Nero, D. (2014). Contractor prequalification – An (in)effective risk management tool. *TBM Tunnel Business Magazine,* 2-3. Vancouver: Benjamin Media, Inc.

Haight, J. M. (2008). *The safety professionals' handbook.* Des Plaines, IL: American Society of Safety Engineers.

Hammer, W. (1989). *Occupational safety management and engineering*. Englewood Cliffs, NJ: Prentice-Hall.

Hersman, D. A. (2018, February). CEOs who "get it". *Safety & Health Magazine*, 38. St. Louis, Missouri: National Safety Council.

Insurance Research Council. (2015, November 18). *Telematics changing drivers' behavior: Insurance research*. Retrieved from https: //www.insurancejournal.com/news/national /2015/11/18/ 389327.htm

MacLaury, J. (1981). The Job Safety Law of 1970: Its passage was perilous. *Monthly Labor Review,* 1-7.

Manuele, F. A. (2013). *On the practice of safety.* Hoboken, NJ: John Wiley & Sons, Inc.

OSHA. (2001, August 6). Consultation policies and procedures manual. *OSHA 2001 Directive 00-01 (CSP-02).* Washington, DC: Department of Labor.

Reese, C. D., & Eidson, J. C. (1999). *Handbook of OSHA construction safety and health*. New York, NY: Lewis Publishers.

Song, S., Awolusi, I., & Marks, E. (2017). Impact of discretionary safety funding. *Journal of Safety, Health & Environmental Research, 23*(3), 378-384.

Waehrer, M. G., Dong, X. S., Miller, T., Haile, E., & Men, Y. (2007). Costs of occupational injuries in construction in the United States. *Accident Analysis and Prevention*, 1258-1266.

Wouters, P. I., & Bos, J. M. (2000). Traffic accident reduction by monitoring driver behavior with in-car data recorders. *Accident Analysis & Prevention,* 643-650.