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E-Book

Predictive Maintenance: What Every Maintenance Department Needs to Know

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The Future of Fleet Maintenance is Predictive

The job of maintaining a fleet of vehicles is no walk in the park. It's a challenging task, filled with many facets and a never-ending list of costs.

The American Transportation Research Institute (ATRI) reports that a whopping 11% of operational expenses — roughly $24,100 per semi-truck every 100,000 miles—go towards maintenance and tires alone.

That's a significant chunk of your budget devoted solely to upkeep, and it doesn't even begin to cover the myriad of other direct costs, such as insurance and fuel.

But there's more to it than the expenses you can readily account for. Hidden beneath the iceberg are the implied costs that tend to appear at the least opportune moments.

Picture this: one of your vehicles breaks down mid-route. Now you're not just facing the direct cost of repairing the vehicle. There's also the towing bill, the revenue lost during the vehicle's downtime, and the ripple effect of missed opportunities and delayed deliveries. There's also the customer's trust to consider, which could be severely damaged if deliveries consistently run late.

All these factors, combined, can drastically decrease the revenue per vehicle and turn the task of fleet management into a challenging puzzle.

Now, imagine if you could know in advance when a vehicle is about to break down. That's not science fiction; it's a real thing.

It's called ***predictive maintenance***, and it's reshaping the way we handle fleet management. This groundbreaking approach to fleet management is poised to revolutionize the way we think about and handle maintenance.

But what exactly is it, and how can it help you overcome some of the biggest challenges in fleet maintenance?

Let's delve into the fascinating world of predictive maintenance and see how it's creating waves in our industry.

Average Marginal Costs of Trucking, 2022

	Per Mile	Per 100,000 Miles	% of Total
Vehicle-based			
Fuel Costs	$0.641	$64,100	28%
Truck/Trailer Lease or Purchase Payments	$0.331	$33,100	15%
Repair & Maintenance	$0.196	$19,600	9%
Tires	$0.045	$4,500	2%
Truck Insurance Premiums	$0.088	$8,800	4%
Permits & Licenses	$0.015	$1,500	1%
Tolls	$0.028	$2,800	1%
Driver-based			
Driver Wages	$0.724	$72,400	32%
Drive Benefits	$0.183	$18,300	8%
TOTAL	**$2.251**	**$225,100**	**100%**

**Source: ATRI - An Analysis of the Operational Costs of Trucking: 2023 Update*

Understanding Predictive Maintenance

So, what is predictive maintenance?

Simply put, predictive maintenance is a game-changing approach that uses data-driven insights to foresee potential vehicle issues before they occur. By implementing predictive maintenance, you're essentially getting a heads-up about the vehicle problems before they happen, allowing you to fix them ahead of time and avoid the dreaded unplanned downtime.

Now, you might be asking, "What's in it for me?" The benefits are plentiful.

Let's start with a significant reduction in maintenance repair costs.

How so? By catching problems early on, repairs are typically less expensive than if you wait until the problem gets worse. It's like going to the doctor at the first sign of a cold versus waiting until it turns into pneumonia. Early detection and intervention can keep small issues from ballooning into major ones, saving your budget in the long run.

Next, predictive maintenance contributes to a safer and more satisfying work environment for drivers.

Breakdowns are not only costly; they can be downright dangerous and stressful for the driver involved. Being stranded on the side of the road is a situation no driver wants to find themselves in. With predictive maintenance, you can significantly reduce the risk of these hazardous breakdowns, ensuring the safety of your drivers and the smooth running of your operations.

Further, predictive maintenance can help improve compliance scores.

By maintaining your fleet in top-notch condition, you're less likely to encounter issues during inspections, which can lead to better compliance ratings. This can result in fewer penalties, lower insurance premiums, and an improved company image.

All these benefits combine to help you prevent missed opportunities and bolster your revenue.

Predictive Maintenance vs Preventative Maintenance: What's the Difference?

At this point, you might be thinking, "This sounds like preventative maintenance." It's an understandable question.

At a high level, both preventive and predictive maintenance aim to preclude unexpected breakdowns and lower maintenance costs. However, a critical difference exists between the two.

Traditional preventative maintenance is like following a strict diet based on generic nutritional advice—it's a one-size-fits-all approach. You adhere to a set schedule for maintenance tasks, regardless of whether the vehicle needs it or not. It's a time-based or usage-based strategy, with assumption that similar vehicles will need the same maintenance at the same intervals.

While it's better than reacting to breakdowns as they occur, it can lead to unnecessary maintenance tasks and can still leave room for surprise breakdowns.

Predictive maintenance, on the other hand, is a step beyond.

It is an evolved form of preventive maintenance that leverages real-time monitoring and data-driven decisions to determine maintenance needs. It's like having a personal nutritionist who gives advice based on your unique needs and adjusts as those needs change.

Instead of sticking to a strict maintenance schedule, predictive maintenance utilizes historical data and real-time monitoring to make data-driven action plans. It uses advanced algorithms to analyze data collected from your vehicles, detecting patterns and trends that can indicate when a part is likely to fail.

This data-driven approach leads to a change in mindset or a paradigm shift, where maintenance is performed when needed, not just because the calendar says so.

By harnessing the power of predictive maintenance, you're stepping into the future of fleet management—one where data drives decision-making, costs are curtailed, and vehicle breakdowns are drastically reduced. It's a future where you're not just reacting to problems but preempting them, leading to improved efficiency and cost-effectiveness in your operations.

The Key Components of a Predictive Maintenance Solution

Diving into the mechanics of predictive maintenance, there are several essential components that contribute to its success. Each of these elements plays a unique role, and together they form a comprehensive, intelligent system designed to revolutionize maintenance strategies.

Data

First, let's talk about data - and by data, we mean loads and loads of it.

Predictive maintenance thrives on historical data, which fuels its complex algorithms and models. The more data, the better the results. We're talking about data from different vehicle makes, models, and year; data from diverse equipment and components; data spanning across different types of conditions and circumstances.

This includes data from vehicle sensors, maintenance records, driver reports, and more. This robustness and variety of data enable predictive maintenance systems to understand and interpret a wide spectrum of scenarios and make accurate predictions.

However, data is only as valuable as the insights derived from it. This is where expertise in two different disciplines - data science and vehicle repair - comes into play.

Data scientists are the whizzes who crunch the numbers, extract patterns, develop algorithms, and fine-tune the models that make predictive maintenance possible. On the other side, we have master technicians who understand the ins and outs of vehicles. They use their technical know-how to interpret the data-driven insights in the right context, ensuring the information provided by the system is actionable and relevant.

Connected Technology

Next up is connected technologies that continuously gather diverse vehicle diagnostics data, from engine performance to brake usage and fuel consumption, across an entire fleet.

For predictive maintenance to be effective, high quality vehicle diagnostic data must be captured in real-time and transferred to a central telematics data platform, like CalAmp's Telematics Cloud (CTC), which sets the stage for early detection of any potential issues that lead to mechanical failure.

Consider CTC as the data workbench, a place where the raw vehicle data is laid out and then enriched. It weaves in additional details from partner databases and models, enhancing the raw data with more context and value.

Predictive analytics then step in, just like a mechanic might use a diagnostic tool on the workbench. They process and examine the data, using predictive algorithms to reveal hidden patterns and trends. This can include everything from minor variations in fuel consumption to more significant changes in engine performance.

These insights help maintenance managers refine their understanding of their fleet's health and performance and make informed decisions that improve the overall efficiency of their maintenance strategy.

Integrations

Lastly, integration is a crucial component. With CTC, predictive maintenance can be seamlessly integrated with an easy-to-use interface that hides the complex pieces behind the scenes. This includes fleet management systems, vehicle health monitoring systems, and maintenance scheduling software.

This harmonious integration ensures that the predictive maintenance solution can be easy to use, and efficiently operate within the existing framework, enhancing instead of disrupting operations.

Let's visualize predictive maintenance like a well-conducted orchestra. The data is the sheet music, the foundational piece providing the necessary information. The expertise in data science and vehicle repair are the musicians, each playing their instrument, interpreting the music in their unique way. Real-time data ingestion and data tools are the rhythm, the pace at which the music flows. And finally, integration is the conductor, ensuring all parts come together harmoniously, creating a beautiful symphony of proactive, precise maintenance.

Overcoming Implementation Challenges

As we all know, changes can sometimes bring challenges. Shifting from the traditional way of doing things to predictive maintenance isn't an exception.

First, let's talk about data quality. To make accurate predictions, you need good, clean data. But sometimes, the data might be incomplete, incorrect, or not relevant. This can create confusion and lead to inaccurate predictions.

Also, there can be technical hurdles. Think about the technology needed to gather and analyze the data. You need systems that can talk to each other, and not all systems are designed to do that. This can lead to integration issues, where the data isn't flowing smoothly from one system to another.

Then there's the human factor. People need to understand the new system and how to use it. This means staff training. But people may be resistant to change, and training can take time and resources.

But don't worry, these challenges can be overcome.

With CalAmp's Telematics Cloud, the heavy lifting of data collection and analysis becomes much easier. CTC is designed to ingest and stream the data smoothly, meaning data quality issues become a thing of the past.

What about the technical stuff? CTC is designed to integrate seamlessly with other systems, reducing the potential for technical issues. And to make the transition even easier, CalAmp provides comprehensive support, including training resources and professional services to help your staff get up to speed quickly and easily.

So, yes, there may be challenges when transitioning to predictive maintenance. But with a partner like CalAmp, with over 10M globally connected assets and experience with complex customers and use cases, these can be effectively managed and overcome.

The result? A smoother, more efficient maintenance operation that keeps your vehicles on the road and out of the repair shop.

Looking to the Future of Predictive Maintenance

Imagine a future where vehicles almost never break down unexpectedly. Where maintenance becomes something that's done just in time, and never too late or too early.

That's the future we see with predictive maintenance.

As we collect more and more data from vehicles, we learn more about how they work and when they might fail. This constant flow of data helps fine-tune existing algorithms, making them even better at spotting potential problems before they happen.

We're also working on better ways to collect data. Right now, we pull a lot of information from vehicles' onboard computers. But in the future, we might use more sensors or even devices that can "listen" to a vehicle's engine or "feel" its vibrations. This could give us even more data to work with, which would make predictions even more accurate.

And remember when we talked about real-time monitoring? That's only going to get better. The technology is improving all the time, so we can look forward to faster, more detailed updates about our vehicles' condition. This can help us react even quicker when something starts to go wrong.

So, what does this all mean for fleets?

It could change the way we think about maintenance. Instead of fixing things when they break or replacing parts on a schedule, we could start doing maintenance exactly when it's needed. This could save time and money, and it could make our vehicles more reliable. In fact, it could make unexpected breakdowns a thing of the past.

That's a future we're excited to be part of, and we hope you are too.

The Bottom Line: Predictive Maintenance is Becoming an Imperative

Adopting predictive maintenance is no longer an option - it's a necessity for any fleet manager looking to stay competitive in today's challenging business environment.

With CalAmp, you're in good hands. By leveraging the power of data and predictive analytics, you can transform your maintenance operations from a reactive to a proactive stance.

Predictive maintenance offers a way to minimize downtime, reduce costs, enhance safety, and maximize the value of your fleet. With technology continuing to evolve at a rapid pace, now is the perfect time to embrace predictive maintenance and future-proof your fleet management operations.

Don't get left behind - start your predictive maintenance journey today. Learn more about CalAmp's advanced maintenance solutions for fleets.

About CalAmp

CalAmp (Nasdaq: CAMP) provides flexible solutions to help organizations worldwide monitor, track and protect their vital assets. Our unique combination of software, devices and platform enables over 14,000 commercial and government organizations worldwide to increase efficiency, safety and transparency while accommodating the unique ways they do business. With over 10 million active edge devices and 275+ issued or pending patents, CalAmp is the telematics leader organizations turn to for innovation and dependability. For more information, visit calamp.com, or LinkedIn, Facebook, Twitter, YouTube or CalAmp Blog.

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