



Digital Tire Management and Monitoring System for Pavara Traders and Services (TireOptiTrack)

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01. Introduction

"Pavara Traders and Services" is a key player in machinery repair and maintenance at the South Asia Gateway Terminals (SAGT) in the bustling port of Colombo. Their varied workload is meticulously organized, with our software development group zooming in on the tire section for our ambitious project.

Within the port's dynamic environment, diverse vehicles and machinery roll in, each with its set of wheels that require careful attention. Pavara's tire checks are timed to perfection, with specific intervals for different vehicle types. They measure not just air pressure and tread depth but also keep tabs on distance traveled, tire crossing patterns, and the tire's status – whether it's brand new or a trusty rethread.

There are various kinds of vehicles and machinery working in the port. Pavara has to check tires of them on time to time (there is a specific time period to check which varying vehicle type to type) of them and manage them without affecting ongoing processes in the port.

Mainly they measure air pressure and tread depth of the tire. And so, distance reading of the vehicle in km, tire crossing pattern, tire status (As new tire, rethreaded tire), tire brands are taken down to get an idea about what is the most effective tire brand for a particular vehicle or machinery.

Then they write all that information in tabled logbooks which are assigned to vehicle type to type. As example one logbook for Prime movers, one for RTGs. Some pictures of them are attached below.

Tire inflation & Thread depth Record : Terminal Vehicle NO. PM 07

Tire Position	Tire serial No	Date 01/06		Date 01/27		Date		Date		KM
		Thread	Air	Thread	Air	Thread	Air	Thread	Air	
1		10	13.6	19	14.0					
2										
3		22	14.0	22	13.7					
4		22	13.8	22	14.5					
5		22	13.5	21	14.1					
6		25	13.5	24	13.8					
7										
8										

Tire inflation & Thread depth Record : Terminal Vehicle NO.

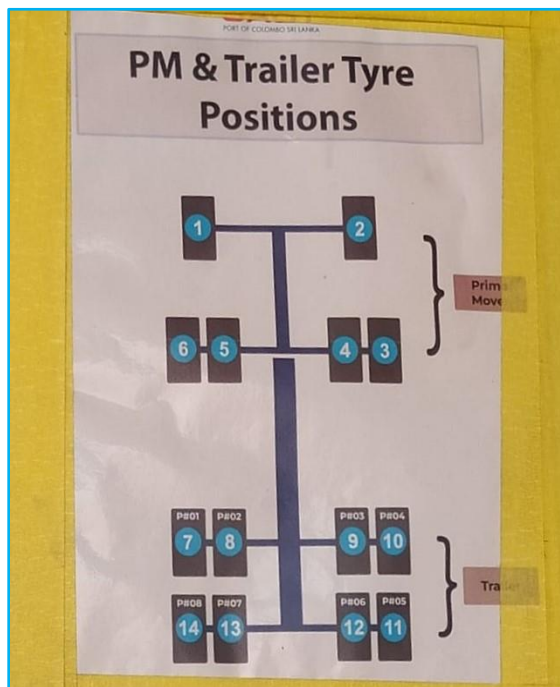
Tire Position	Tire serial No	Date		Date		Date		Date		KM
		Thread	Air	Thread	Air	Thread	Air	Thread	Air	
1										
2										
3										
4										
5										
6										
7										
8										

Tire inflation & Thread depth Record : Terminal Vehicle NO. PM 13

Tire Position	Tire serial No	Date 01/04		Date 01/12		Date 01/13		Date 01/25		KM
		Thread	Air	Thread	Air	Thread	Air	Thread	Air	
1		23	14.0	22	12.8	23	13.0	12	13.9	
2		14	13.9	13	13.0	13	13.9	24	13.8	
3		23	13.9	24	13.5	25	13.6	24	13.9	
4		24	14.1	24	14.0	25	13.7	24	13.3	
5		25	14.4	25	13.7	26	14.1	15	13.9	
6		20	13.9	20	13.6	25	13.8	23	13.5	
7										
8										

Tire inflation & Thread depth Record : Terminal Vehicle NO. PM 13

Tire Position	Tire serial No	Date		Date		Date		Date		KM
		Thread	Air	Thread	Air	Thread	Air	Thread	Air	
1										
2										
3										
4										
5										
6										
7										
8										



Terminal Vehical : Tire states : Vehical NO.

Tire Position	Tire states & Serial No		Brand of	KM	DATE		Tire cross Pattern
	New Tire	Rethread Tire			Reading	Depth	
1							
2							
3							
4							
5							
6							
7							
8							

Terminal Vehical : Tire states : Vehical NO.

Tire Position	Tire states & Serial No		Brand of	KM	DATE		Tire cross Pattern
	New Tire	Rethread Tire			Reading	Depth	
1							
2							
3							
4							
5							
6							
7							
8							

Terminal Vehical : Tire states : Vehical NO.

Tire Position	Tire states & Serial No		Brand of	KM	DATE		Tire cross Pattern
	New Tire	Rethread Tire			Reading	Depth	
1							
2							
3							
4							
5							
6							
7							
8							

They identify the tire by its serial number and tire position in the vehicle as above structure. They can identify which tire is positioned in which vehicle in which position with the help of vehicle number, tire position number and serial number of the tire.

Keeping track of tire information manually has a few problems. Firstly, using a logbook takes a lot of time and effort for writing, finding, and understanding the data. This slow process makes it hard to manage tires efficiently. Plus, it's not easy to look back at past data to figure out things, which makes it tough to make good decisions about tire maintenance. The lack of real-time monitoring means we might miss important issues, as the manual system relies on periodic checks instead of instant updates. Lastly, relying on paper records can lead to losing or damaging data, making tire management even more complicated.

Therefore, we proposed new software system to them which they can input measured data into a database with computers or mobile phones and monitor data real-time, and get idea about tire performance with visualization parts and without measuring tire predict next measurements with old data, send alerts to users if there are issues in tires, authentication system for different kind of users (for managers and employees).

Introducing a new software system for tire management at Pavara Traders and Services comes with lots of advantages. It makes things faster by reducing the time and effort needed for dealing with tire data. The system also helps in understanding the tire information better. The best part is that it allows for real-time monitoring, so potential problems with tires are spotted right away. The software can even predict future tire measurements using old data, helping plan maintenance in advance. Alerts are sent out if there are any issues, ensuring a quick response. Plus, the system keeps all the tire data safe in one place, reducing the risk of losing or damaging information. With different access levels for managers and employees, it ensures that only the right people can see sensitive details. Overall, this new system makes tire management much easier and efficient for Pavara.

2. Fact Finding

2.1 Justification of Fact-Finding Techniques Used

Pavara Traders and Services, servicing the South Asia Gateway Terminals (SAGT) at the Port of Colombo, operates within a high-security environment. The stringent security protocols at the port necessitate a detailed process for obtaining passes to enter. This process is time-consuming, posing logistical challenges for simultaneous field visits by our group members due to security restrictions.

To overcome these constraints, we opted for alternative fact-finding techniques that do not require physical presence at the port. Conducting interviews with the client through phone calls and online meetings proved to be a viable solution. This approach allowed us to gather valuable insights into the ongoing tire management processes without the need for physical access. Additionally, we utilized questionnaires to delve deeper into specific aspects of the tire section's operations.

While the option for a field visit remains under consideration, the current security procedures and time constraints make it a complex undertaking. Thus, our chosen fact-finding methods provide a practical and effective alternative for understanding the tire management processes at Pavara Traders and Services, ensuring progress in our project despite the challenges posed by the security protocols at the Port of Colombo.

2.2 Completeness and Quality of Fact-Finding

In our pursuit to understand how Pavara Traders and Services manages tires, we had important talks with Mr. C. Wanniarachchi and Mr. R.M. Karunathilaka. These leaders shared valuable insights during our online meetings and class discussions, helping us grasp the details of their current system and what they need in a new one.

We asked about the problems they face with their current tire system and learned about the challenges they tackle every day. From how they measure tire tread depth and air pressure to the time intervals for these measurements, we dived into the nitty-gritty details. Understanding the changes in tire cross patterns and figuring out when a tire is no longer safe for use were also key points in our discussions.

Discovering how many times a tire can bounce back and how to spot faults in vehicles by looking at tire tread details, like problems with wheel alignment, added more layers to our understanding. The conversation also touched on the different tire brands they use and how they decide which brand works best for specific vehicles or machinery.

We didn't stop there. We explored the process of writing down these measurements in logbooks, finding out how they keep a record of tire data. Additionally, we learned how this collected data plays a role in analyzing tire performance. In simpler terms, we wanted to know how they make sense of all these numbers and details to keep the tires and vehicles in top shape.

Our discussions aimed to gather a complete picture of their tire management world. We wanted to make sure we're not missing any important details as we plan to build a new software system tailored to their needs. It's like putting together a puzzle – each piece of information helps us see the whole picture better.

These talks were like a journey where we uncovered the challenges Pavara Traders and Services face in their tire world. From the first turn of the tire wrench to the final logbook entry, every step was explored. We wanted to understand not just the "what" but also the "how" and the "why" behind their tire management processes.

Now armed with this treasure trove of information, we're better equipped to create a software system that fits like a glove. Our aim is to simplify their tire management, making it more efficient and less stressful. And these talks with Mr. C. Wanniarachchi and Mr. R.M. Karunathilaka were the compass guiding us in the right direction.