



# HEART BEAT

2023

POWER FLEET®

People Powered IoT

# Toyota Customer Story

Reducing Driving Impacts and Increasing Data-Driven Decision Making





## Pat O'Reagan

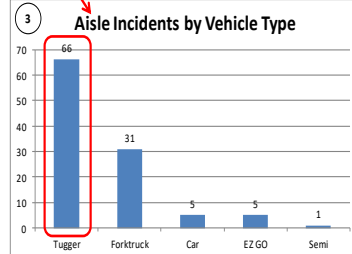
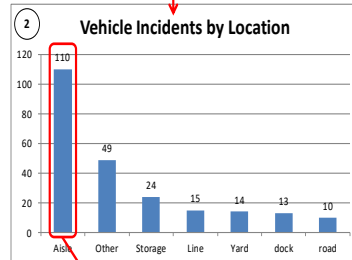
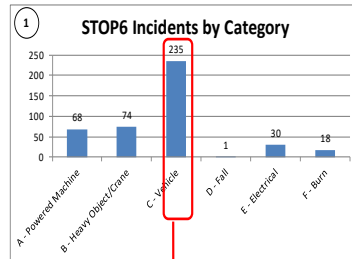
Safety Engineer

[patrick.oreagan@toyota.com](mailto:patrick.oreagan@toyota.com)

# Background – Why VMS

Toyota started a mobile equipment safety activity in 2017

## Data



## Focus Areas

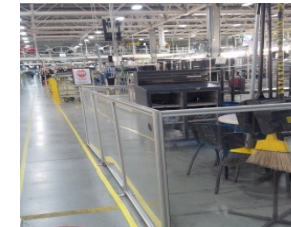
- Safe Equipment Operation
- Mobile Equipment Separation
- Safety Mindset

### Safety Equipment



Dolly Brake Light

### Separation



Clear Separation

### Mindset



Training Rodeo

# Background – Why VMS

## Toyota standardized safety devices to have on mobile equipment

Surveyed facilities to determine mobile equipment safety devices being used to help reduce Safety incidents.

### Surveyed

**TUGGER SAFETY EQUIPMENT N/A STANDARD**

**PURPOSE:** Identify safety equipment on all Tuggers. Why we are addressing this Standard First.

**PROBLEM BREAKDOWN:** Includes bar charts for 'Stops Incidents by Location', 'Web Incidents by Location', and 'Stops Incidents by Vehicle Type'. A table shows 'Tugger in Aisle by Interaction'.

**TARGET SETTINGS:** Address 37% of Contributing Factors of Step 6 Occurrence through 1. Inspecting all Mobile Equipment for Safety Equipment on all Tuggers. 2. Visually Breakthrough Safety Items.

**GRASP CURRENT TUGGER SAFETY EQUIPMENT STATUS:** A grid showing the status of various safety items across different Tugger models.

**SAFETY ITEM EVALUATION:** A table evaluating the effectiveness of various safety items like lights, mirrors, and seat belts.

**RECOMMENDATION:** Lists 'Normally Required Items' and 'Breakthrough Safety Items' such as Horn, Forward Red Spot Light, and Solid Steel 'Shoulder' Stabilizer.



### Standardized

**TUGGER REQUIRED SAFETY SPECS**

**PURPOSE:** Identify safety equipment on all Tuggers. Why we are addressing this Standard First.

**PROBLEM BREAKDOWN:** Includes bar charts for 'Stops Incidents by Location', 'Web Incidents by Location', and 'Stops Incidents by Vehicle Type'. A table shows 'Tugger in Aisle by Interaction'.

**TARGET SETTINGS:** Address 100% of Contributing Factors of Step 6 Occurrence through 1. Inspecting all Mobile Equipment for Safety Equipment on all Forklifts. 2. Visually Breakthrough Safety Items.

**GRASP CURRENT FORKLIFT SAFETY EQUIPMENT STATUS:** A grid showing the status of various safety items across different Forklift models.

**SAFETY ITEM EVALUATION:** A table evaluating the effectiveness of various safety items like lights, mirrors, and seat belts.

**RECOMMENDATION:** Lists 'Normally Required Items' and 'Breakthrough Safety Items' such as Horn, Forward Red Spot Light, and Solid Steel 'Shoulder' Stabilizer.

**FORKLIFT REQUIRED SAFETY SPECS**

**PURPOSE:** Identify safety equipment on all Forklifts. Why we are addressing this Standard First.

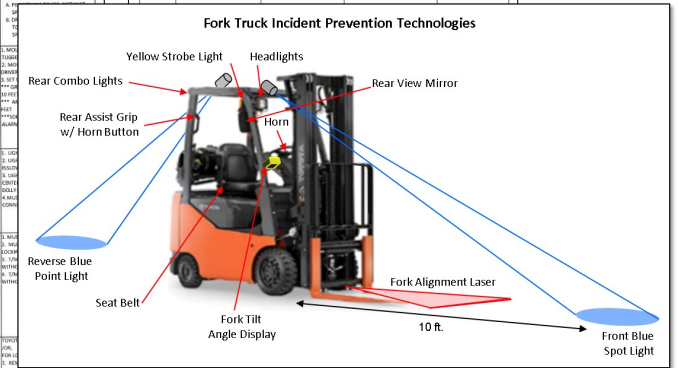
**PROBLEM BREAKDOWN:** Includes bar charts for 'Stops Incidents by Location', 'Web Incidents by Location', and 'Stops Incidents by Vehicle Type'. A table shows 'Forklift in Aisle by Interaction'.

**TARGET SETTINGS:** Address 100% of Contributing Factors of Step 6 Occurrence through 1. Inspecting all Mobile Equipment for Safety Equipment on all Forklifts. 2. Visually Breakthrough Safety Items.

**GRASP CURRENT FORKLIFT SAFETY EQUIPMENT STATUS:** A grid showing the status of various safety items across different Forklift models.

**SAFETY ITEM EVALUATION:** A table evaluating the effectiveness of various safety items like lights, mirrors, and seat belts.

**RECOMMENDATION:** Lists 'Normally Required Items' and 'Breakthrough Safety Items' such as Horn, Forward Red Spot Light, and Solid Steel 'Shoulder' Stabilizer.



# Background – Why VMS

## Safety Equipment was Categorized

Safety Equipment Categories:

1. Proximity Judgement
2. Awareness / Visibility to Powered Industrial Vehicles (PIV)
3. Awareness / Visibility to Pedestrians
4. Safe Operation / Handling
5. Ergonomics

### Forklift

Safety Equipment		Proximity Judgment	Awareness / Visibility to MHE	Awareness / Visibility to Pedestrian	Safe Operation / Handling	Ergo	Qty per Vehicle
Breakthrough	FRONT BLUE SPOT LIGHT	●	●	●			1
	TILT ANGLE (DISPLAY)						1
	VMS				●		1
Normal	REAR ASSIST GRIP W/ HORN BUTTON		●	●		●	1
	REAR COMBO LIGHTS		●	●			2
	REAR-VIEW MIRROR	●					2
	REAR BLUE SPOT LIGHT	●	●	●			1
	YELLOW STROBE LIGHT		●	●			1
	HEADLIGHTS	●	●	●			2
	SEAT BELTS				●		1
	HORN		●	●			1
7 MPH / 12 KPH Max Speed				●		1	
Summary		4	7	7	3	1	

### Tow Motor

Safety Equipment		Proximity Judgment	Awareness / Visibility to PIV	Awareness / Visibility to Pedestrian	Safe Operation / Handling	Ergo	Qty per Vehicle
Breakthrough	Brake Light on Final Dolly	●	●				1
	Front Proximity Sensor - Manual Steer	●					1
	Front Proximity Sensor - Electric Steer	●					1
	FRONT RED SPOT LIGHT	●	●	●			1
	VMS				●		1
Normal	ERGONOMIC SELF-CLOSING HITCH				●	●	1
	STABILIZER				●		2
	HORN		●	●			1
	7 MPH Max Speed				●		1
Summary		3	3	2	4	1	

# Background – Why VMS

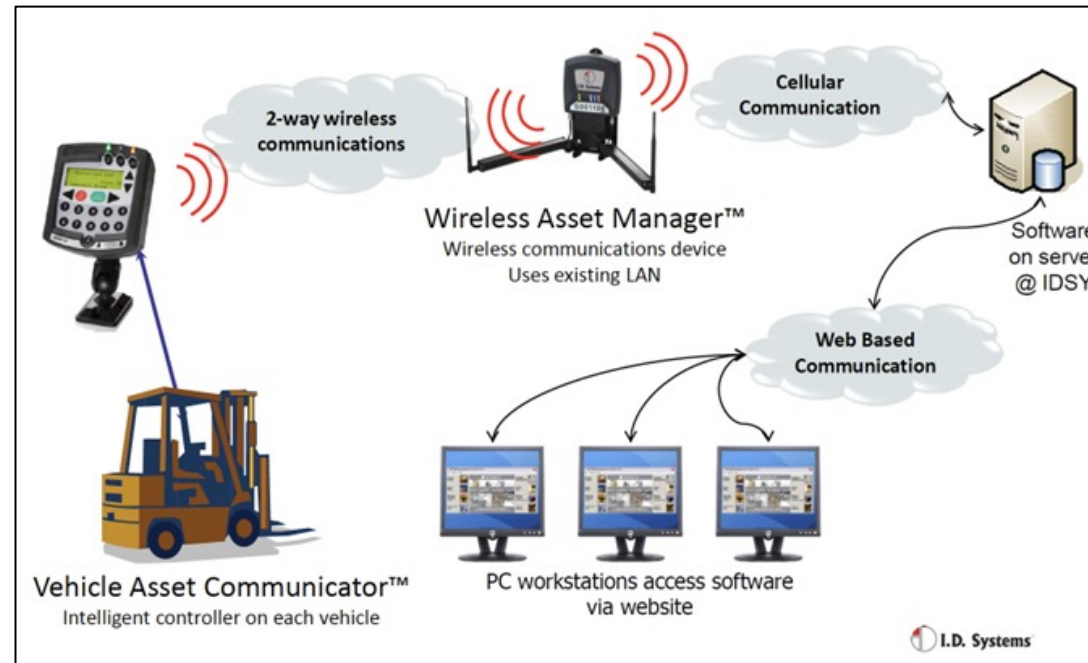
VMS is a useful tool for helping measure Safe Operation and Handling.

## Primary Benefit

- Impact Detection Logic
  - Measurement of vehicle behavior change

## Additional Benefits

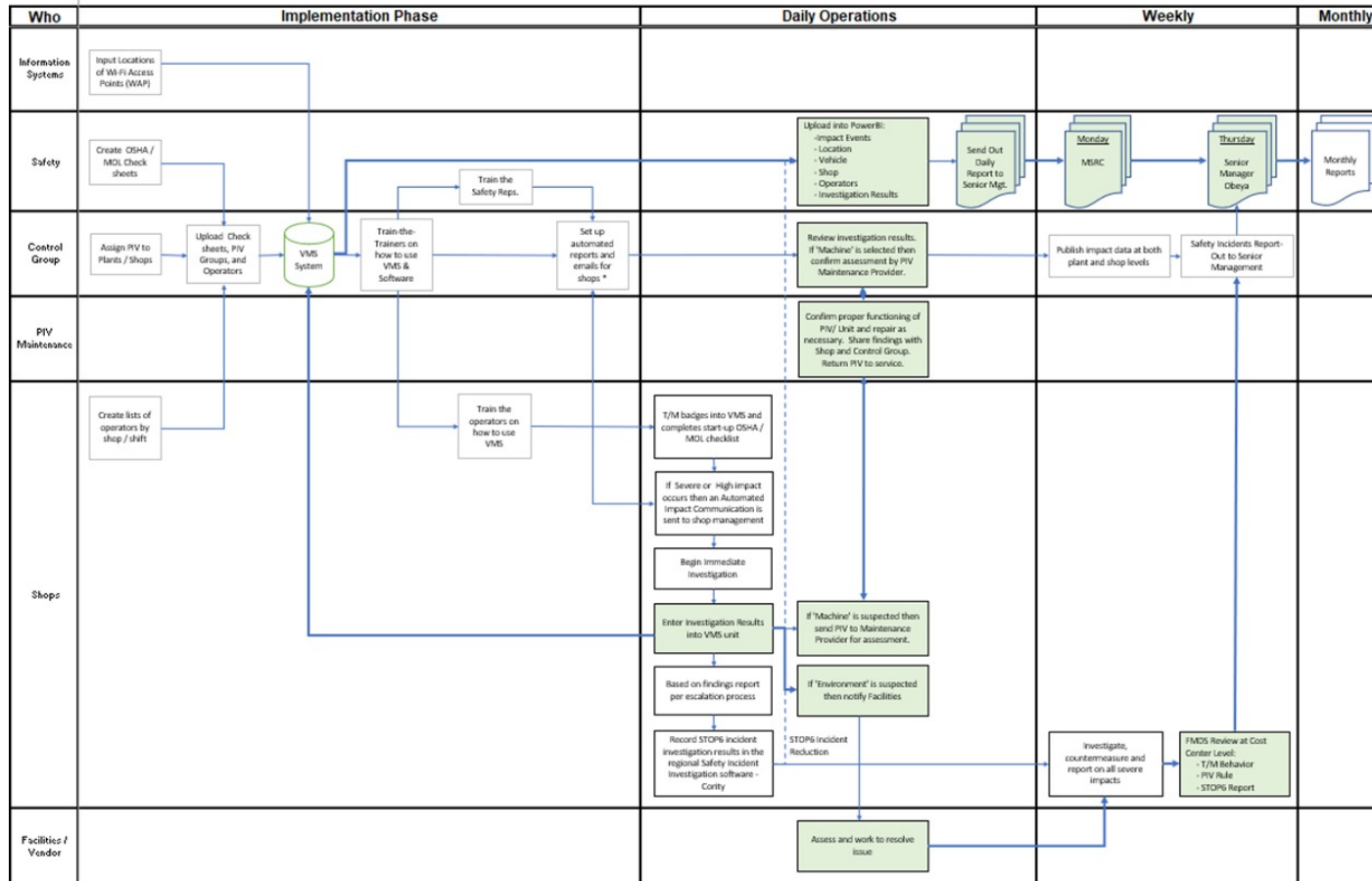
- Access control
  - Badge access control for certified operators
- Safety checklist
  - Electronically store OSHA/MOL required pre-shift vehicle inspection
  - Vehicle Location
  - See where is the vehicle or driver
  - Correlate areas having incidents
- PM Management
  - Maintenance scheduling / notification



# Background – VMS Management Process

VMS Process established September 2017

Toyota Motor North America (TMNA) Process for Utilizing the Data from the Vehicle Management System (VMS)





# Background – VMS Management Process

Adjusted threshold settings and started using, visualizing, and sharing January 2018.

## Standardized Severity Thresholds to:

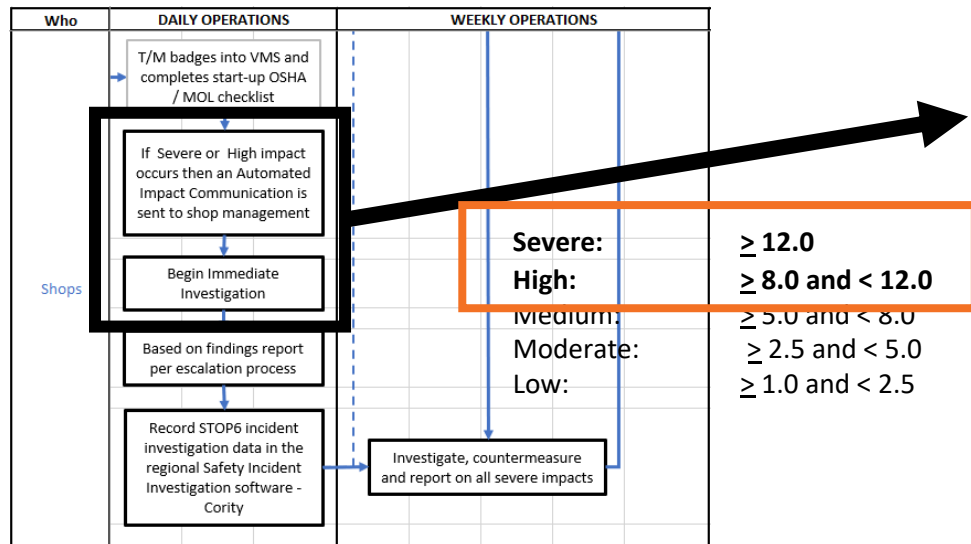
- Low: 1.0 to < 2.4
- Moderate: > 2.5 to < 4.9
- Medium: > 5.0 to < 7.9
- High: > 8.0 to < 11.9
- Severe: > 12.0

Severity Range	Low	Moderate	Medium	High	Severe
Initial Default Settings	< 1.5	< 1.5 to < 2.0	< 2.0 to < 5.0	< 5.0 to < 8.0	> 8.0
Toyota N.A. Standard	< 1.0 to < 2.5	> 2.5 to < 5.0	> 5.0 to < 8.0	> 8.0 to < 12.0	> 12.0
	1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4	2.5 2.6 2.7 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9	5.0 5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9 6.0 6.1 6.2 6.3 6.4 6.5 6.6 6.7 6.8 6.9 7.0 7.1 7.2 7.3 7.4 7.5 7.6 7.7 7.8 7.9	8.0 8.1 8.2 8.3 8.4 8.5 8.6 8.7 8.8 8.9 9.0 9.1 9.2 9.3 9.4 9.5 9.6 9.7 9.8 9.9 10.0 10.1 10.2 10.3 10.4 10.5 10.6 10.7 10.8 10.9 11.0 11.1 11.2 11.3 11.4 11.5 11.6 11.7 11.8 11.9	12.0 12.1 12.2 12.3 12.4

# Background – VMS Management Process

- Forklifts or Tow Motors shut down after VMS detects a high or severe event.
- Impact events 'trigger' a text / e-mail being sent to shop management so that they can begin an immediate investigation and unlock PIV.
- Team Members should 'Stop, Call, & Wait' after an incident, and this helps ensure that impact events are investigated and reported.

## VMS Process



## Investigation & Reporting

**INTERNAL LOGISTICS GROUP NOTIFICATION REPORT**

Date Of Incident: \_\_\_\_\_ Time Of Incident: \_\_\_\_\_ Group Lead: \_\_\_\_\_

Medgate # \_\_\_\_\_ Short Description: \_\_\_\_\_

TM Times On Job \_\_\_\_\_

**SAFETY REPORT ITEMS**

Process Of Incident

Safety Notified

EI Notified (if applicable)

Production Resumed

TM Statement (back of form)

Quad Form Filled Out (front of form)

Video Sent To Group (if available)

Medgate Documents

Quad Form (front and back for all reports)

STW

Risk Assessment

Copy Of Last Process Audit

Pictures Uploaded

Medgate Notification

YES License (if applicable)

Diagram Of Incident (if applicable)

DHS Pass (if applicable)

Email Notification Sent Out

Copies Of Documents Left At AM And Mgr Desk

Shift  Day  Night

Stop 6  Level 1  Level 2 (Safety)  Level 3  Level 4 (First - Adv) (NI M or NI L)

EI Cause  Yes  No

IVP Reporting  Yes  No

**PRODUCTION REPORT ITEM:**

Over 30 Minutes  Yes  No

OT Total \_\_\_\_\_

Line \_\_\_\_\_

Team \_\_\_\_\_

Frame \_\_\_\_\_

Final \_\_\_\_\_

Man \_\_\_\_\_

Method \_\_\_\_\_

Material \_\_\_\_\_

Machine \_\_\_\_\_

TM Statement (back of quad form)

Quad Form Filled Out (front of form)

Production Resumed

Added To Pasdown

**MANAGER LEVEL: SYSTEM PROBLEM EXPOSURE REPORT (Circle One)**

**SAFETY** **QUALITY** **PRODUCTIVITY**

PROBLEM

Recurring Problem? Yes, When?  Yes  No

Main System Cause: (Circle One)

Process  Clear  TM

Judgement

Problem Statement:

COUNTERMEASURES (ACTIONS)

WHO and WHEN

(Sheet Cover: Circle All That Apply)

BEHAVIORAL	PROCESS	QUALITY	EMPLOYMENT
Did not complete	Did not complete	No quality on machine	Did not get out in standard
Did not complete within 15 minutes	Did not complete within 15 minutes	Machine not operating	Part not back at safety
Did not complete within 30 minutes	Did not complete within 30 minutes	Strong smell on the machine	Oil based not identified
Did not complete within 45 minutes	Did not complete within 45 minutes	Oil on machine	Oil based not identified
Did not complete within 1 hour	Did not complete within 1 hour	Oil on machine	Oil based not identified
Did not complete within 1.5 hours	Did not complete within 1.5 hours	Oil on machine	Oil based not identified
Did not complete within 2 hours	Did not complete within 2 hours	Oil on machine	Oil based not identified
Did not complete within 3 hours	Did not complete within 3 hours	Oil on machine	Oil based not identified
Did not complete within 4 hours	Did not complete within 4 hours	Oil on machine	Oil based not identified
Did not complete within 5 hours	Did not complete within 5 hours	Oil on machine	Oil based not identified

TM's Statement Of Issue: \_\_\_\_\_ Date: \_\_\_\_\_

Back, was there anything that could have been done to avoid In low can we make the Risk apparent for the next TM Performing th

any Lessons learned or Reflection Points that can be shared w in an effort to avoid further risk of an Incident or Injury? (Explain)

How could this problem be avoided in the future?

any issues or obstacles that you can identify that you need Man support on, to allow you to better perform your job more Safely?

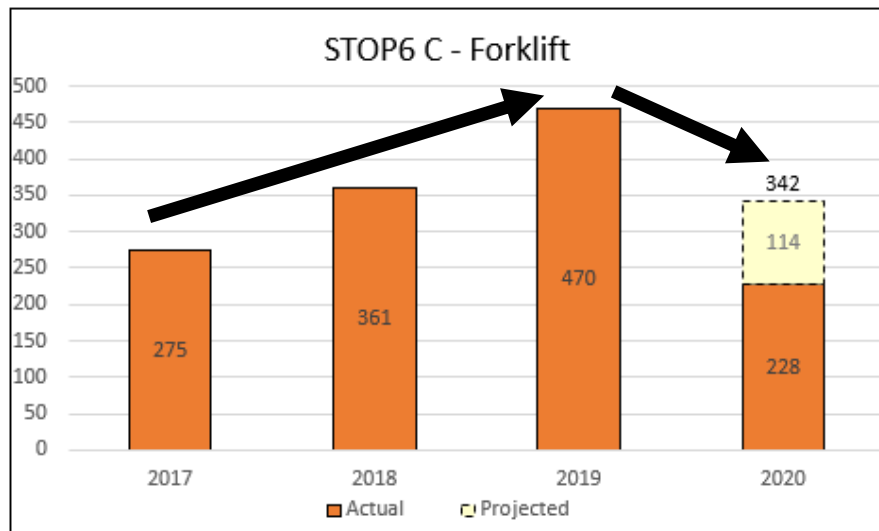
TM Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Print Name: \_\_\_\_\_ ID# \_\_\_\_\_

# Reported Incidents vs VMS Implementation

Based on previous data, as more VMS units were deployed, we anticipated having more incidents reported before seeing a decline

## Forklift

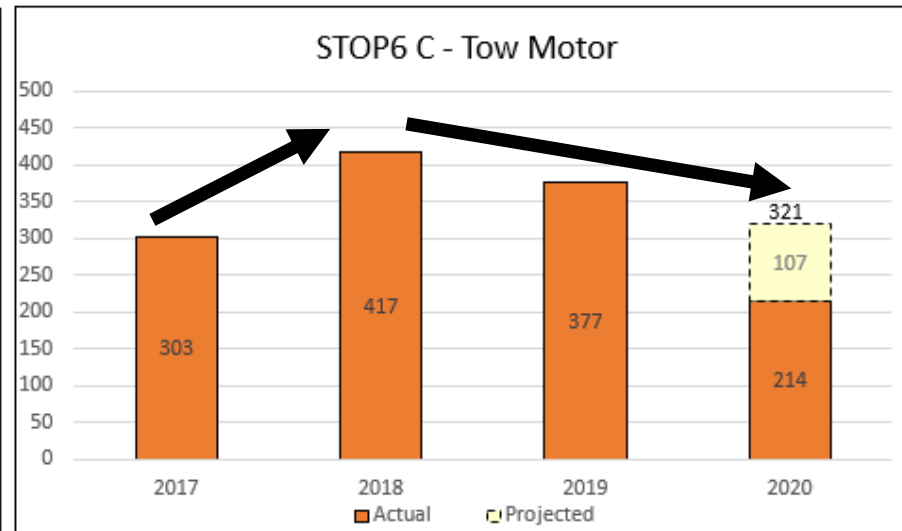


	2017	2018	2019	2020
Projected	-	-	-	114
Actual	275	361	470	228

### Safety Equipment

	2017	2018	2019	2020
VEHICLE MANAGEMENT SYSTEM	43%	54%	64%	71%

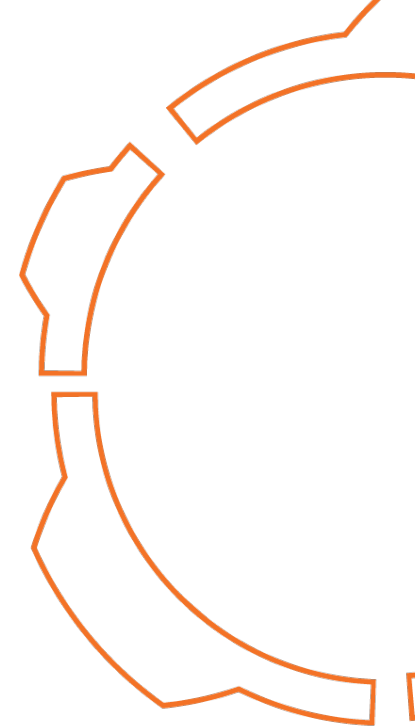
## Tow Motor



	2017	2018	2019	2020
Projected	-	-	-	107
Actual	303	417	377	214

### Safety Equipment

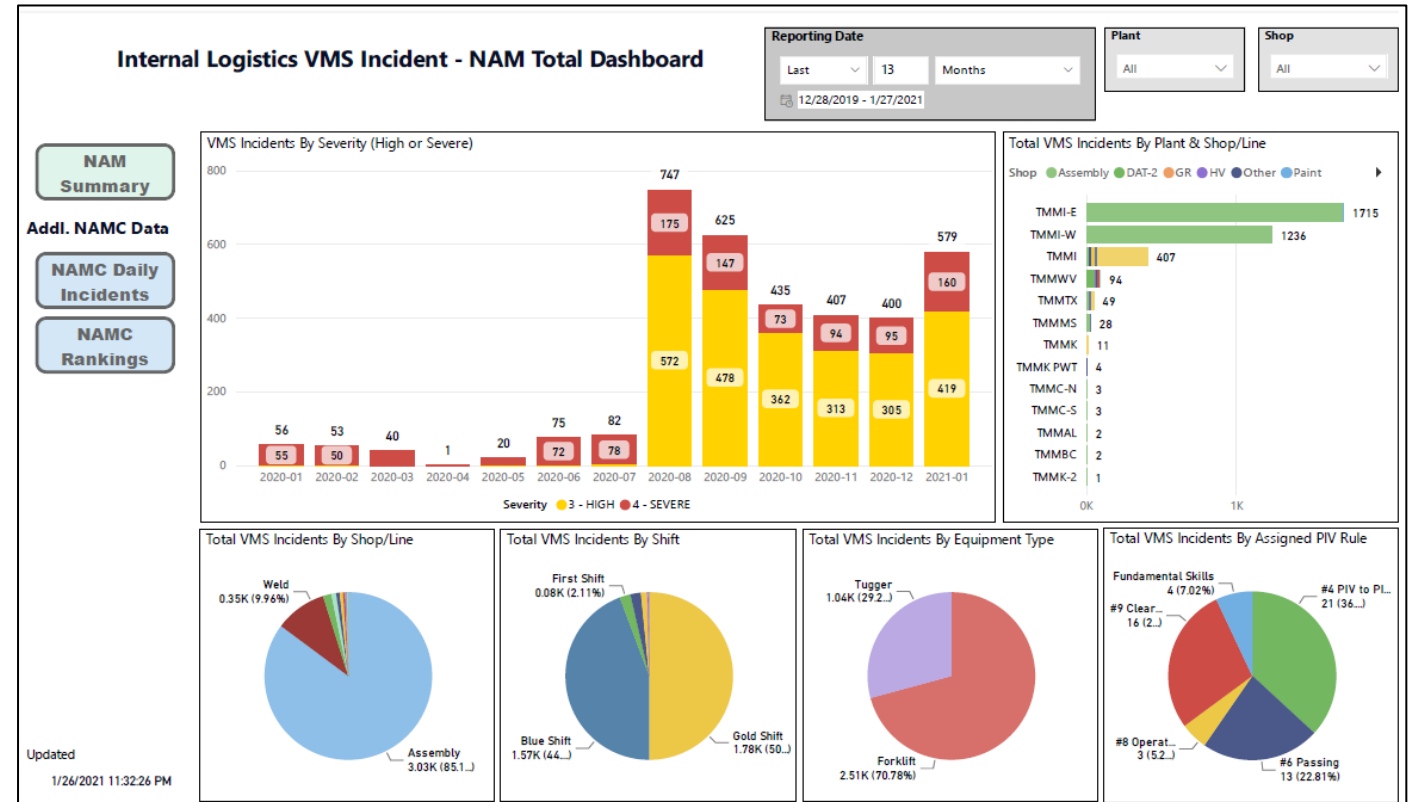
	2017	2018	2019	2020
VEHICLE MANAGEMENT SYSTEM	30%	42%	63%	65%





# VMS Event Visualization

- Recognized that we needed better and more frequent visualization of High & Severe events
- Set-up Daily Downloads of VMS data and post using PowerBI



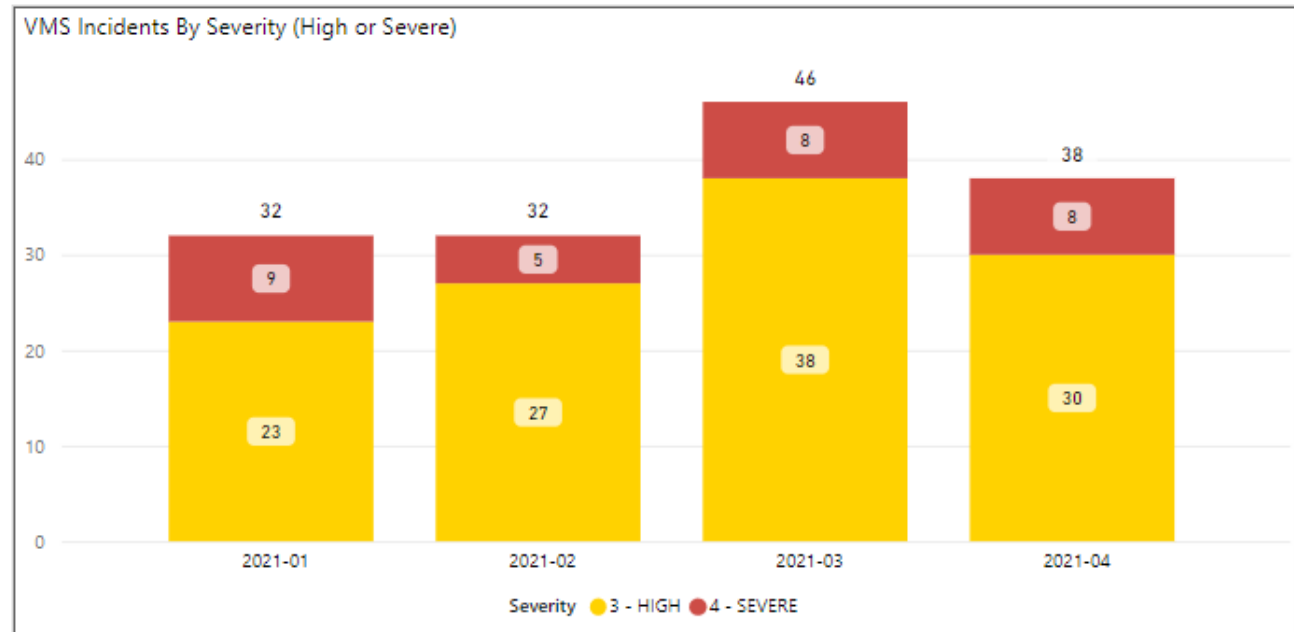
# VMS Data Source

- Total VMS Incidents by Severity (High or Severe)

## VMS Data

Veh_Ext_ID_2	Impact Date Time	Severity	Max_G Impac	Max_Duratic	Impact_Rati
TMMMS Assembly	Apr 6, 2021 3:01:54 PM	3 - HIGH	2.4	254	8.04
TMMMS Assembly	Apr 6, 2021 6:48:18 PM	3 - HIGH	5.2	138	11.78
TMMMS Assembly	Apr 7, 2021 12:42:54 AM	4 - SEVERE	9.7	152	14.20
TMMMS Assembly	Apr 7, 2021 7:25:52 AM	3 - HIGH	3.4	92	8.79
TMMMS Assembly	Apr 7, 2021 11:28:34 PM	3 - HIGH	4.1	254	9.38
TMMMS Assembly	Apr 8, 2021 1:42:44 AM	4 - SEVERE	7.9	173	14.47
TMMMS Assembly	Apr 8, 2021 8:20:18 AM	4 - SEVERE	5.5	254	12.42
TMMMS Assembly	Apr 8, 2021 8:45:54 AM	3 - HIGH	3.5	254	8.15
TMMMS Assembly	Apr 8, 2021 11:18:08 PM	3 - HIGH	3.4	153	8.29
TMMMS Assembly	Apr 12, 2021 6:29:30 AM	4 - SEVERE	9.8	150	23.89
TMMMS Assembly	Apr 12, 2021 7:14:34 AM	3 - HIGH	3.4	187	10.24
TMMMS Assembly	Apr 12, 2021 11:49:46 AM	3 - HIGH	10.0	212	9.22
TMMMS Assembly	Apr 12, 2021 8:53:46 PM	3 - HIGH	7.8	88	8.06
TMMMS Assembly	Apr 13, 2021 2:21:00 AM	3 - HIGH	3.2	157	8.79
TMMMS Assembly	Apr 13, 2021 9:08:10 AM	3 - HIGH	4.6	137	9.41
TMMMS Assembly	Apr 14, 2021 10:43:10 AM	3 - HIGH	4.5	160	8.66
TMMMS Assembly	Apr 14, 2021 12:34:42 PM	3 - HIGH	5.3	138	8.21
TMMMS Assembly	Apr 14, 2021 7:05:28 PM	3 - HIGH	1.6	160	8.88
TMMMS Assembly	Apr 15, 2021 8:00:28 AM	3 - HIGH	5.5	60	11.30
TMMMS Assembly	Apr 16, 2021 1:06:48 AM	3 - HIGH	7.0	118	10.36
TMMMS Assembly	Apr 16, 2021 1:36:20 AM	3 - HIGH	3.0	124	8.37
TMMMS Assembly	Apr 16, 2021 2:11:22 AM	3 - HIGH	4.6	155	9.90
TMMMS Assembly	Apr 17, 2021 12:20:42 AM	3 - HIGH	7.4	120	9.53
TMMMS Assembly	Apr 19, 2021 2:37:30 PM	3 - HIGH	3.7	253	8.34
TMMMS Assembly	Apr 20, 2021 8:00:30 AM	4 - SEVERE	10.0	182	15.09
TMMMS Assembly	Apr 20, 2021 10:48:14 AM	3 - HIGH	2.5	116	8.71
TMMMS Assembly	Apr 21, 2021 10:13:10 AM	4 - SEVERE	3.7	254	14.01
TMMMS Assembly	Apr 21, 2021 11:35:36 AM	4 - SEVERE	4.2	254	13.41
TMMMS Assembly	Apr 21, 2021 2:49:24 PM	3 - HIGH	4.6	155	10.03

## PowerBI



# VMS Data Source

## Total VMS Incidents by Plant & Shop/Line

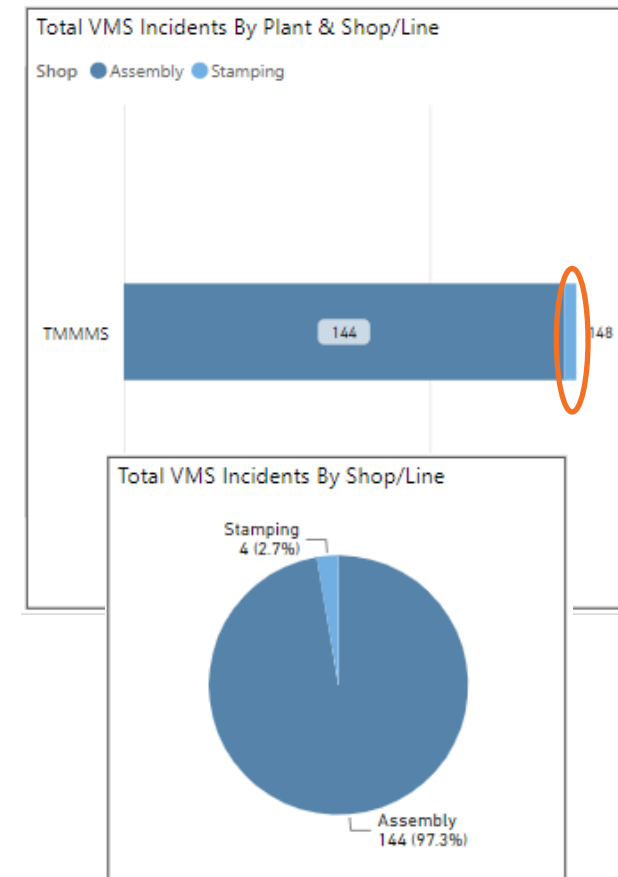
### VMS System

General Profile		
VAC Number FR - 64248	External ID 1 64248	External ID 2 TMMMS Stamping
VAC Serial Number S19-VP014175-IMS	Vehicle Class Class 1	Weight Class
Purchased Date	Capacity 5,000 Lbs.	Parking Location Stamping
MAC Address 88-DA-1A-3F-FC-74	Date Added 1/17/2020 10:14:44 AM	Last Modified 1/5/2021 3:41:09 PM

### VMS Download

Veh Ext ID 2	Impact Date Time	Severity
TMMMS Stamping	Mar 5, 2021 2:08:42 PM	3 - HIGH
TMMMS Assembly	Mar 5, 2021 3:25:08 PM	3 - HIGH
TMMMS Assembly	Mar 5, 2021 6:41:34 PM	3 - HIGH
TMMMS Assembly	Mar 5, 2021 9:44:32 PM	3 - HIGH
TMMMS Assembly	Mar 8, 2021 6:37:10 AM	3 - HIGH
TMMMS Assembly	Mar 8, 2021 7:05:36 AM	3 - HIGH
TMMMS Assembly	Mar 9, 2021 11:18:48 PM	3 - HIGH
TMMMS Assembly	Mar 11, 2021 8:32:14 AM	4 - SEVERE
TMMMS Assembly	Mar 11, 2021 9:28:52 PM	3 - HIGH
TMMMS Assembly	Mar 12, 2021 7:21:38 AM	4 - SEVERE
TMMMS Assembly	Mar 12, 2021 7:21:42 AM	4 - SEVERE
TMMMS Assembly	Mar 12, 2021 1:03:06 PM	3 - HIGH
TMMMS Assembly	Mar 15, 2021 7:53:28 AM	3 - HIGH
TMMMS Assembly	Mar 15, 2021 8:11:14 AM	3 - HIGH
TMMMS Assembly	Mar 15, 2021 3:15:36 PM	3 - HIGH
TMMMS Assembly	Mar 16, 2021 3:46:10 AM	4 - SEVERE
TMMMS Assembly	Mar 16, 2021 6:55:40 AM	3 - HIGH
TMMMS Assembly	Mar 16, 2021 8:58:38 AM	3 - HIGH
TMMMS Assembly	Mar 18, 2021 12:30:12 AM	3 - HIGH
TMMMS Assembly	Mar 18, 2021 1:44:08 AM	3 - HIGH
TMMMS Assembly	Mar 18, 2021 1:52:12 AM	3 - HIGH
TMMMS Assembly	Mar 23, 2021 10:54:44 AM	3 - HIGH
TMMMS Assembly	Mar 23, 2021 2:50:52 PM	3 - HIGH
TMMMS Assembly	Mar 24, 2021 9:23:54 AM	3 - HIGH
TMMMS Assembly	Mar 24, 2021 11:17:56 PM	3 - HIGH
TMMMS Assembly	Mar 26, 2021 11:42:54 AM	3 - HIGH
TMMMS Stamping	Mar 29, 2021 12:35:52 PM	4 - SEVERE
TMMMS Assembly	Mar 29, 2021 11:44:16 PM	3 - HIGH
TMMMS Assembly	Mar 29, 2021 11:51:28 PM	3 - HIGH

### PowerBI



# VMS Data Source

Total VMS Incidents by Shift

VMS System

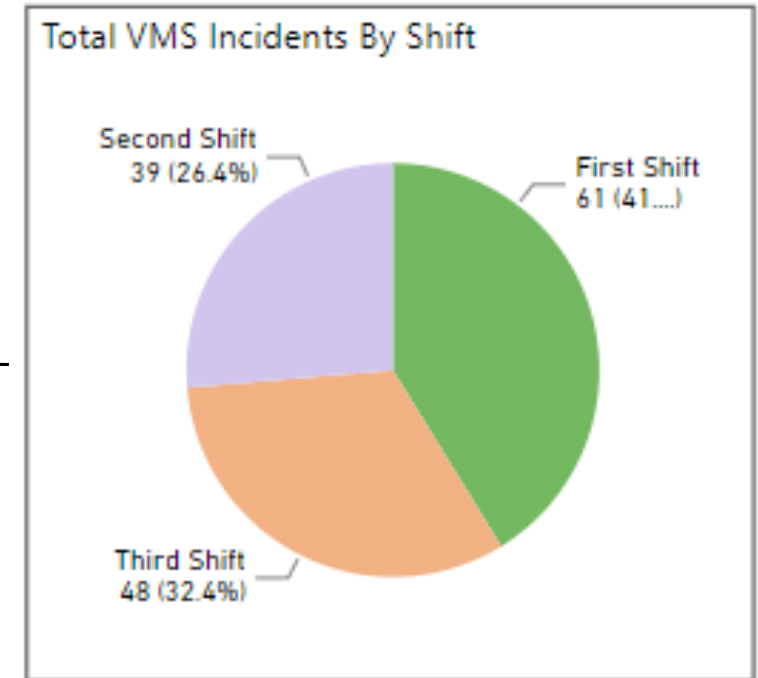
VMS Download

PowerBI

Shifts							
Shift Name	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
First Shift (f)	06:00 AM - 02:00 PM	06:00 AM - 02:00 PM	06:00 AM - 02:00 PM	06:00 AM - 02:00 PM	06:00 AM - 02:00 PM	06:00 AM - 02:00 PM	06:00 AM - 02:00 PM
Second Shift (f)	02:00 PM - 06:00 AM	02:00 PM - 10:00 PM	02:00 PM - 10:00 PM	02:00 PM - 10:00 PM	02:00 PM - 10:00 PM	02:00 PM - 10:00 PM	02:00 PM - 06:00 AM
Third Shift (f)	-	10:00 PM - 06:00 AM	10:00 PM - 06:00 AM	10:00 PM - 06:00 AM	10:00 PM - 06:00 AM	10:00 PM - 06:00 AM	-

Veh_Ext_ID_2	Shift Nam	Impact Date Time	Severity
TMMMS Assembly	Second Shift	Apr 6, 2021 3:01:54 PM	3 - HIGH
TMMMS Assembly	Second Shift	Apr 6, 2021 6:48:18 PM	3 - HIGH
TMMMS Assembly	Third Shift	Apr 7, 2021 12:42:54 AM	4 - SEVERE
TMMMS Assembly	First Shift	Apr 7, 2021 7:25:52 AM	3 - HIGH
TMMMS Assembly	Third Shift	Apr 7, 2021 11:28:34 PM	3 - HIGH
TMMMS Assembly	Third Shift	Apr 8, 2021 1:42:44 AM	4 - SEVERE
TMMMS Assembly	First Shift	Apr 8, 2021 8:20:18 AM	4 - SEVERE
TMMMS Assembly	First Shift	Apr 8, 2021 8:45:54 AM	3 - HIGH
TMMMS Assembly	Third Shift	Apr 8, 2021 11:18:08 PM	3 - HIGH
TMMMS Assembly	First Shift	Apr 12, 2021 6:29:30 AM	4 - SEVERE
TMMMS Assembly	First Shift	Apr 12, 2021 7:14:34 AM	3 - HIGH
TMMMS Assembly	First Shift	Apr 12, 2021 11:49:46 AM	3 - HIGH
TMMMS Assembly	Second Shift	Apr 12, 2021 8:53:46 PM	3 - HIGH
TMMMS Assembly	Third Shift	Apr 13, 2021 2:21:00 AM	3 - HIGH
TMMMS Assembly	First Shift	Apr 13, 2021 9:08:10 AM	3 - HIGH
TMMMS Assembly	First Shift	Apr 14, 2021 10:43:10 AM	3 - HIGH
TMMMS Assembly	First Shift	Apr 14, 2021 12:34:42 PM	3 - HIGH
TMMMS Assembly	Second Shift	Apr 14, 2021 7:05:28 PM	3 - HIGH
TMMMS Assembly	First Shift	Apr 15, 2021 8:00:28 AM	3 - HIGH
TMMMS Assembly	Third Shift	Apr 16, 2021 1:06:48 AM	3 - HIGH
TMMMS Assembly	Third Shift	Apr 16, 2021 1:36:20 AM	3 - HIGH
TMMMS Assembly	Third Shift	Apr 16, 2021 2:11:22 AM	3 - HIGH
TMMMS Assembly	Third Shift	Apr 17, 2021 12:20:42 AM	3 - HIGH
TMMMS Assembly	Second Shift	Apr 19, 2021 2:37:30 PM	3 - HIGH
TMMMS Assembly	First Shift	Apr 20, 2021 8:00:30 AM	4 - SEVERE
TMMMS Assembly	First Shift	Apr 20, 2021 10:48:14 AM	3 - HIGH
TMMMS Assembly	First Shift	Apr 21, 2021 10:13:10 AM	4 - SEVERE
TMMMS Assembly	First Shift	Apr 21, 2021 11:35:36 AM	4 - SEVERE
TMMMS Assembly	Second Shift	Apr 21, 2021 2:49:24 PM	3 - HIGH





# VMS Data Source

## Total VMS Incidents by Equipment Type

VMS System

VMS Download

PowerBI

POWERFLEET® Home Visibility People Groups Assets

Vehicles > Edit > F022

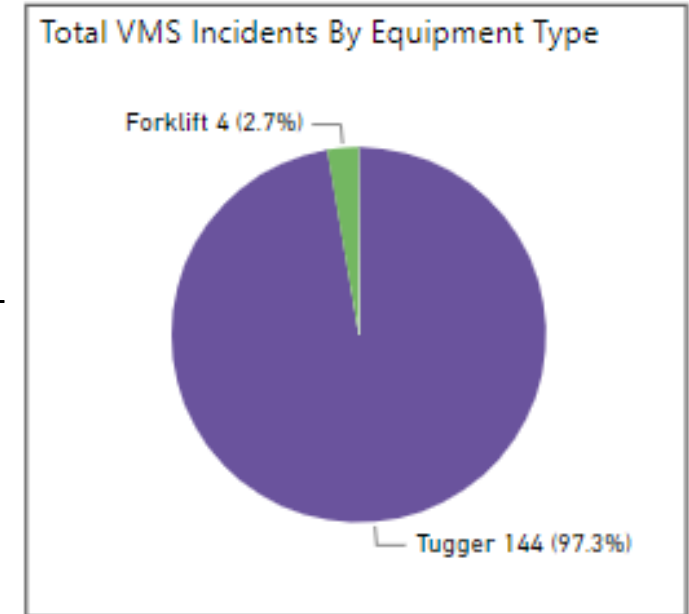
Search current vehic

Name: F022 Vehicle Type: Forklift Rider

DOJO  
Toyota/8TB50/O  
Behavior: TMM Tow

Make: Toyota Model: 7FBCU25

Veh_Ext_ID_2	Model	Impact Date Time	Severity
TMMMS Assembly	TT	Mar 8, 2021 7:05:36 AM	3 - HIGH
TMMMS Assembly	8TB50	Mar 9, 2021 11:18:48 PM	3 - HIGH
TMMMS Assembly	8TB50	Mar 11, 2021 8:32:14 AM	4 - SEVERE
TMMMS Assembly	8TB50	Mar 11, 2021 9:28:52 PM	3 - HIGH
TMMMS Assembly	8TB50	Mar 12, 2021 7:21:38 AM	4 - SEVERE
TMMMS Assembly	8TB50	Mar 12, 2021 7:21:42 AM	4 - SEVERE
TMMMS Assembly	8TB50	Mar 12, 2021 1:03:06 PM	3 - HIGH
TMMMS Assembly	8TB50	Mar 15, 2021 7:53:28 AM	3 - HIGH
TMMMS Assembly	8TB50	Mar 15, 2021 8:11:14 AM	3 - HIGH
TMMMS Assembly	8TB50	Mar 15, 2021 3:15:36 PM	3 - HIGH
TMMMS Assembly	8TB50	Mar 16, 2021 3:46:10 AM	4 - SEVERE
TMMMS Assembly	8TB50	Mar 16, 2021 6:55:40 AM	3 - HIGH
TMMMS Assembly	8TB50	Mar 16, 2021 8:58:38 AM	3 - HIGH
TMMMS Assembly	8TB50	Mar 18, 2021 12:30:12 AM	3 - HIGH
TMMMS Assembly	8TB50	Mar 18, 2021 1:44:08 AM	3 - HIGH
TMMMS Assembly	8TB50	Mar 18, 2021 1:52:12 AM	3 - HIGH
TMMMS Assembly	8TB50	Mar 23, 2021 10:54:44 AM	3 - HIGH
TMMMS Assembly	8TB50	Mar 23, 2021 2:50:52 PM	3 - HIGH
TMMMS Assembly	8TB50	Mar 24, 2021 9:23:54 AM	3 - HIGH
TMMMS Assembly	8TB50	Mar 24, 2021 11:17:56 PM	3 - HIGH
TMMMS Assembly	8TB50	Mar 26, 2021 11:42:54 AM	3 - HIGH
TMMMS Stamping	7FBCU25	Mar 29, 2021 12:35:52 PM	4 - SEVERE
TMMMS Assembly	8TB50	Mar 29, 2021 11:44:16 PM	3 - HIGH
TMMMS Assembly	8TB50	Mar 29, 2021 11:51:28 PM	3 - HIGH
TMMMS Assembly	8TB50	Mar 30, 2021 8:23:08 PM	3 - HIGH
TMMMS Assembly	8TB50	Mar 31, 2021 2:11:08 AM	3 - HIGH
TMMMS Assembly	8TB50	Mar 31, 2021 7:50:04 AM	3 - HIGH
TMMMS Assembly	8TB50	Apr 1, 2021 1:04:34 PM	4 - SEVERE
TMMMS Assembly	8TB50	Apr 1, 2021 6:58:08 PM	3 - HIGH



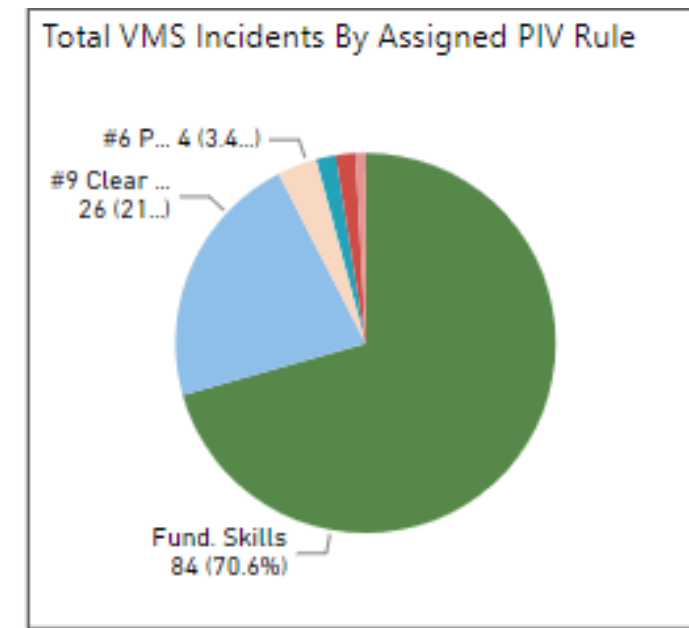
# VMS Data Source

- Total VMS Incidents by Assigned PIV Rule (Behavior, Environment, Material, Machine)
- Lock-out events are Investigated, and the findings can be entered directly through VAC unit

## VMS Data

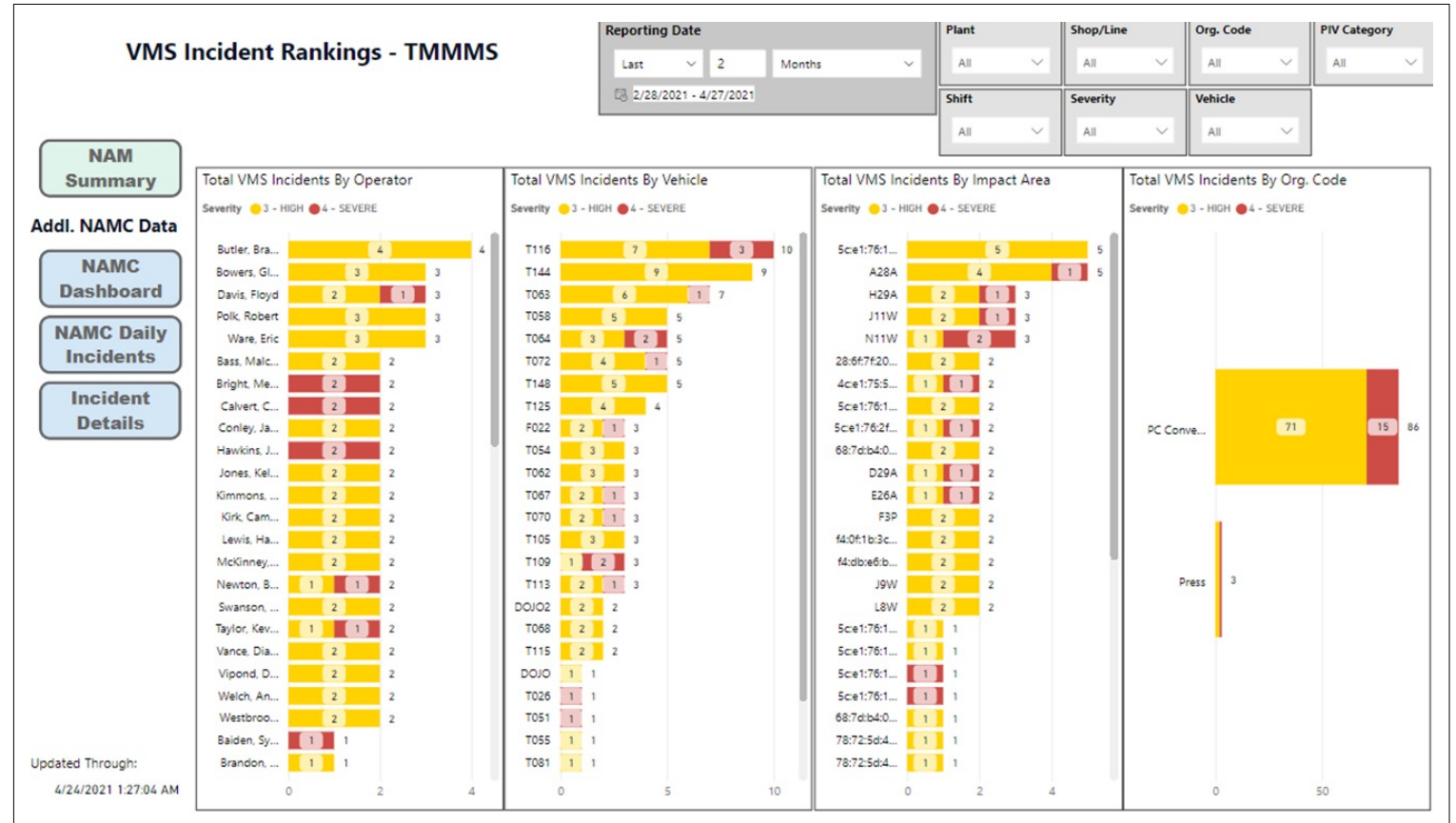
Vehicle	Impact Date Time	Severity	Unlock Operator	Unlock Time	Locked Dur N	Investigation Results	PIV Rule	Incident #
T109	Mar 16, 2021 3:46:10 AM	4 - SEVERE				Behavior	#9 Clear Path of Travel	
T070	Mar 16, 2021 6:55:40 AM	3 - HIGH				Behavior	Fundamental Skills	
T067	Mar 16, 2021 8:58:38 AM	3 - HIGH				Behavior	Fundamental Skills	
T064	Mar 18, 2021 12:30:12 AM	3 - HIGH				Behavior	Fundamental Skills	
T063	Mar 18, 2021 1:44:08 AM	3 - HIGH				Behavior	Fundamental Skills	
T064	Mar 18, 2021 1:52:12 AM	3 - HIGH				Behavior	Fundamental Skills	
T068	Mar 23, 2021 10:54:44 AM	3 - HIGH				Behavior	Passing #6	497493
T063	Mar 23, 2021 2:50:52 PM	3 - HIGH				Behavior	Fundamental Skills	497495
T116	Mar 24, 2021 9:23:54 AM	3 - HIGH				Material	Faulty Wheel	497550
T125	Mar 24, 2021 11:17:56 PM	3 - HIGH				Behavior	Fundamental Skills	497551
T117	Mar 26, 2021 11:42:54 AM	3 - HIGH				Behavior	Fundamental Skills	497634
F022	Mar 29, 2021 12:35:52 PM	4 - SEVERE				Behavior	Fundamental Skills	497662
T063	Mar 29, 2021 11:44:16 PM	3 - HIGH				Behavior	Fundamental Skills	497670
T105	Mar 29, 2021 11:51:28 PM	3 - HIGH				Behavior	Fundamental Skills	
T113	Mar 30, 2021 8:23:08 PM	3 - HIGH				Behavior	Fundamental Skills	
T055	Mar 31, 2021 2:11:08 AM	3 - HIGH				Behavior	Fundamental Skills	
T109	Mar 31, 2021 7:50:04 AM	3 - HIGH				Behavior	Fundamental Skills	
T109	Apr 1, 2021 1:04:34 PM	4 - SEVERE				Behavior	#9 Clear Path of Travel	
T063	Apr 1, 2021 6:58:08 PM	3 - HIGH				Behavior	Fundamental Skills	
T119	Apr 1, 2021 8:25:40 PM	3 - HIGH				Behavior	Fundamental Skills	
T116	Apr 2, 2021 9:44:34 PM	3 - HIGH				Behavior	Fundamental Skills	
T062	Apr 2, 2021 11:32:20 PM	3 - HIGH				Behavior	Fundamental Skills	
T070	Apr 5, 2021 6:38:22 AM	3 - HIGH				Behavior	Fundamental Skills	497817
T062	Apr 5, 2021 11:32:46 AM	3 - HIGH				Behavior	Fundamental Skills	
T148	Apr 6, 2021 12:12:02 AM	3 - HIGH				Behavior	Fundamental Skills	
T072	Apr 6, 2021 12:30:40 PM	3 - HIGH				Behavior	Fundamental Skills	
T072	Apr 6, 2021 3:01:54 PM	3 - HIGH				Behavior	PIV Spacing #4	497848
T144	Apr 6, 2021 6:48:18 PM	3 - HIGH				Behavior	Fundamental Skills	
T026	Apr 7, 2021 12:42:54 AM	4 - SEVERE				Behavior	Clear Path #9	497893

## PowerBI



# VMS Event Visualization

- Page with Impacts by Team Member, PIV, Impact Area, and Org. Code.
- Data can be filtered by Date Range, Plant, Shop, Org. Code, Shift, Severity, Vehicle



# VMS Data Source

- Total VMS Incidents by Operator
- Location Information used for notifying management of an Impact Events

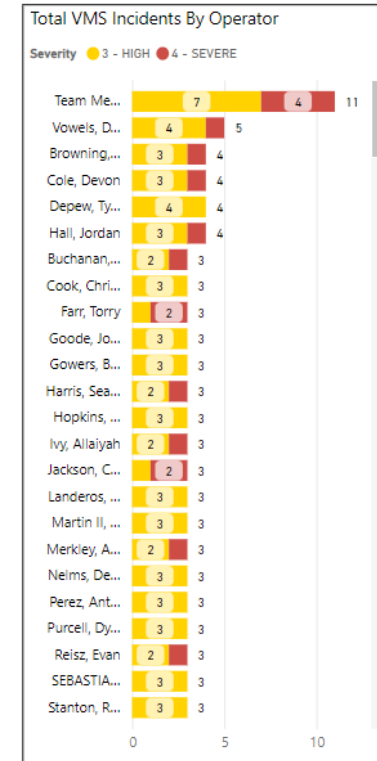
## VMS System

<b>Operator Credentials</b>	<b>First Name</b>	<b>MI</b>	<b>Last Name</b>
Licensed	Pat	--	O'Reagan
<b>Software Access</b>	<b>Login Email Address</b>	<b>Job Title</b>	<b>Organization</b>
Active	patrick.oreagan@toyota.com	Safety Engineer TMNA	TMNA
	<b>Alternate Email Address</b>	<b>Mobile Phone</b>	<b>Mobile Phone Carrier</b>
	--	8598014258	ATT

## VMS Download

Veh_Ext_ID_2	Org_Code	Operator	Vehicle	Model
TMMI East Assembly Final	FC460	James, Mark	F579IN	7FBCU15
TMMMS Weld	Weld	Grice, Veronica	BW22	8TB50
TMMI East Assembly North Dock	FC016	Canillas, Jerecho	T1042IN	8TB50
TMMK Stamping	IP290	Anderson, Logan	F722	8FBC15U
TMMMS Weld	Weld	Newton, Bree	BW13	8TB50
TMMMS Hero	Hero	Nichols, Marcus	PPC-107	8FBCU25
TMMI West Weld Line Call	EX550	Cooper, Jeff	T948IN	8TB50
TMMI East Assembly South Dock	FC420	McPherson, Kiesha	T1114IN	8TB50
TMMMS Assembly	Assembly	Johnson, Jermaine	40	8TB50
TMMMS Assembly	Assembly	James, Jason	40	8TB50
TMMI West Assembly Chassis	EC470	Thompson, Thad	F703IN	8FBC15U
TMMK Facilities	G1140	Powell, David	F521	8FGCU30
TMMK Assembly 2	MA765	Rector Jr, Paul E.	F638	8FBC15U
TMMK Assembly 2	MA765	Rector Jr, Paul E.	F638	8FBC15U
TMMI West Assembly North Dock	EC420	Fritz, Mark	T825IN	8TB50
TMMI East Assembly South Dock	FC420	Groves, Sarah	T1114IN	8TB50
TMMI West Assembly Trim	EC430	Gunselman, Kade	T973IN	8TB50
TMMK Pool	MacIellan	Daniels, Marcus	T533	8TB50
TMMK Assembly 2	IA825	Hall, Jordan a.	F638	8FBC15U
TMMI East Assembly North Dock	FC470	Boyd, Marvin	T1042IN	8TB50
TMMK Assembly 2	MA825	McDaniel, Andrew	F638	8FBC15U
TMMK Assembly 2	MA825	McDaniel, Andrew	F638	8FBC15U
TMMI East Assembly South Dock	FC410	Yarnell, Dennis	T1114IN	8TB50
TMMI East Assembly South Dock	FC420	McPherson, Kiesha	T1114IN	8TB50
TMMI East Assembly South Dock	FC410	Tredway, Bill	T931IN	8TB50

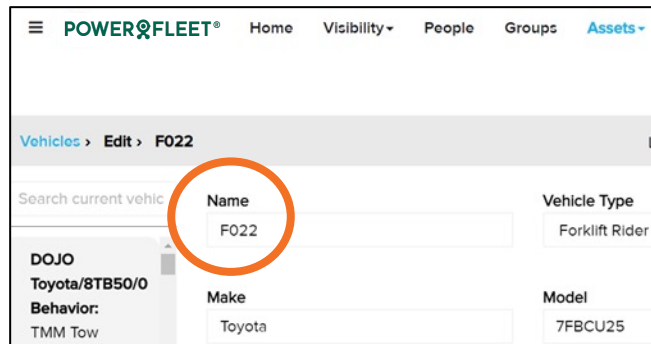
## PowerBI



# VMS Data Source

- Total VMS Incidents by Vehicle

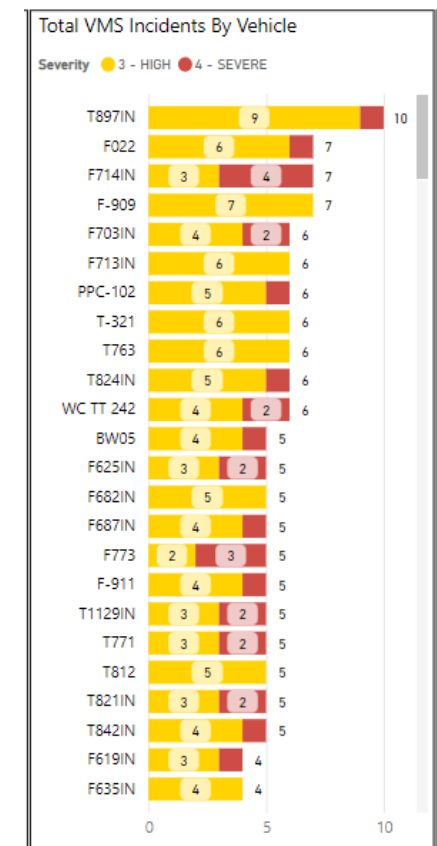
## VMS System



## VMS Download

Veh_Ext_ID_2	Org_Code	Operator	Vehicle	Model
TMMI East Assembly Final	FC460	James, Mark	F579IN	7FBCU15
TMMMS Weld	Weld	Grice, Veronica	BW22	8TB50
TMMI East Assembly North Dock	FC016	Canillas, Jerecho	T1042IN	8TB50
TMMK Stamping	IP290	Anderson, Logan	F722	8FBC15U
TMMMS Weld	Weld	Newton, Bree	BW13	8TB50
TMMMS Hero	Hero	Nichols, Marcus	PPC-107	8FBCU25
TMMI West Weld Line Call	EX550	Cooper, Jeff	T948IN	8TB50
TMMI East Assembly South Dock	FC420	McPherson, Kiesha	T1114IN	8TB50
TMMMS Assembly	Assembly	Johnson, Jermaine	40	8TB50
TMMMS Assembly	Assembly	James, Jason	40	8TB50
TMMI West Assembly Chassis	EC470	Thompson, Thad	F703IN	8FBC15U
TMMK Facilities	G1140	Powell, David	F521	8FGCU30
TMMK Assembly 2	MA765	Rector Jr, Paul E.	F638	8FBC15U
TMMK Assembly 2	MA765	Rector Jr, Paul E.	F638	8FBC15U
TMMI West Assembly North Dock	EC420	Fritz, Mark	T825IN	8TB50
TMMI East Assembly South Dock	FC420	Groves, Sarah	T1114IN	8TB50
TMMI West Assembly Trim	EC430	Gunselman, Kade	T973IN	8TB50
TMMK Pool	MacLellan	Daniels, Marcus	T533	8TB50
TMMK Assembly 2	IA825	Hall, Jordan a.	F638	8FBC15U
TMMI East Assembly North Dock	FC470	Boyd, Marvin	T1042IN	8TB50
TMMK Assembly 2	MA825	McDaniel, Andrew	F638	8FBC15U
TMMK Assembly 2	MA825	McDaniel, Andrew	F638	8FBC15U
TMMI East Assembly South Dock	FC410	Yarnell, Dennis	T1114IN	8TB50
TMMI East Assembly South Dock	FC420	McPherson, Kiesha	T1114IN	8TB50
TMMI East Assembly South Dock	FC410	Tredway, Bill	T931IN	8TB50

## PowerBI



# VMS Data Source

- Total VMS Incidents by Impact Area
- Location Information used to notifying management of an Impact Events

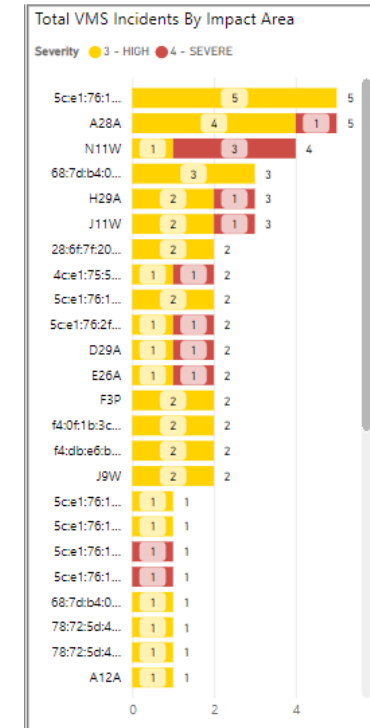
## VMS System

Device Type	Name	Floor	Status
Access Points	J11W	1	Active
<b>Description</b>			
TMMMS-150-J-11W			
<b>General Settings</b>			
<b>BSSID</b>	<b>Device Code</b>	<b>Last VAC Detected</b>	
f4:0f:1b:39:29:a_	007C	4/22/2021 8:42:58 PM	

## VMS Download

Impact Date Time	Severity	Impact_Loc
Apr 6, 2021 3:01:54 PM	3 - HIGH	J11W
Apr 6, 2021 6:48:18 PM	3 - HIGH	5c:e1:76:1e:3e:a
Apr 7, 2021 12:42:54 AM	4 - SEVERE	5c:e1:76:1e:94:a
Apr 7, 2021 7:25:52 AM	3 - HIGH	Out of range
Apr 7, 2021 11:28:34 PM	3 - HIGH	J9W
Apr 8, 2021 1:42:44 AM	4 - SEVERE	5c:e1:76:1e:b6:8
Apr 8, 2021 8:20:18 AM	4 - SEVERE	N11W
Apr 8, 2021 8:45:54 AM	3 - HIGH	Out of range
Apr 8, 2021 11:18:08 PM	3 - HIGH	C6W
Apr 12, 2021 6:29:30 AM	4 - SEVERE	E26A
Apr 12, 2021 7:14:34 AM	3 - HIGH	68:7d:b4:06:e9:8
Apr 12, 2021 11:49:46 AM	3 - HIGH	E15A
Apr 12, 2021 8:53:46 PM	3 - HIGH	Out of range
Apr 13, 2021 2:21:00 AM	3 - HIGH	78:72:5d:4d:54:a
Apr 13, 2021 9:08:10 AM	3 - HIGH	f4:0f:1b:3c:2d:0
Apr 14, 2021 10:43:10 AM	3 - HIGH	E26A
Apr 14, 2021 12:34:42 PM	3 - HIGH	Out of range
Apr 14, 2021 7:05:28 PM	3 - HIGH	A28A
Apr 15, 2021 8:00:28 AM	3 - HIGH	F27A
Apr 16, 2021 1:06:48 AM	3 - HIGH	f4:0f:1b:3c:2d:0
Apr 16, 2021 1:36:20 AM	3 - HIGH	28:6f:7f:20:21:0
Apr 16, 2021 2:11:22 AM	3 - HIGH	28:6f:7f:20:21:0
Apr 17, 2021 12:20:42 AM	3 - HIGH	Out of range
Apr 19, 2021 2:37:30 PM	3 - HIGH	Out of range
Apr 20, 2021 8:00:30 AM	4 - SEVERE	F10W
Apr 20, 2021 10:48:14 AM	3 - HIGH	78:72:5d:4d:54:8
Apr 21, 2021 10:13:10 AM	4 - SEVERE	J11W
Apr 21, 2021 11:35:36 AM	4 - SEVERE	H10W
Apr 21, 2021 2:49:24 PM	3 - HIGH	Out of range

## PowerBI



# VMS Data Source

- Total VMS Incidents by Organization Code
- Shop or Cost Center Information to which the operator is assigned

## VMS System

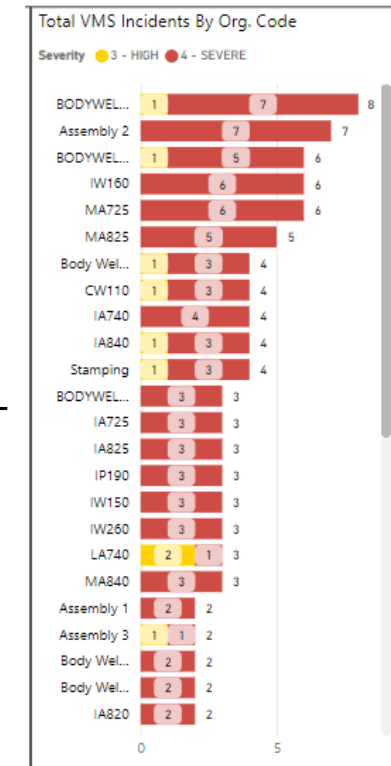
## VMS Download

## PowerBI

Operator First Name MI Last Name  
 Credentials TIM E TREICHEL  
 Licensed  
 Software Login Email Address Job Title  
 Access tim.treichel@toyota.com Production Control

Organization  
 FA300

Veh_Ext_ID_2	Org_Code	Operator
TMMK Assembly 2	IA740	SUTTOR, DURRETT S.
TMMK Assembly 2	MA840	PRICE, JON P.
TMMK Assembly 1	IA820	Spencer, Kevin E.
TMMK Assembly 2	MA825	Barnes, Brandon
TMMK Weld 3	BODYWELD 3	Mattingly, Mary
TMMK Assembly 2	MA840	Rodgers, Adam
TMMK Plastics	Plastics	Vermillion, Chad D.
TMMK Weld 2	MW260	ROSE, CHERI L.
TMMK Weld 1	IW260	Roe, Jeffrey
TMMK Weld 2	Body Weld	Dryer, Isabella
TMMK Assembly 1	IA725	Mitchell, Jeffery
TMMK Weld 3	BODYWELD 1	Turbek, Mathew
TMMK Weld 1	IW160	FELTON, RODNEY A.
TMMK Assembly 2	ASSEMBLY 2	CHAPPELL, GUY L.
TMMK Weld 3	BODYWELD 3	Weaver, D'Anria
TMMK Assembly 1	IA840	STEWART, JACOB L.
TMMK Weld 1	IW160	Dix, Robert
TMMK Weld 3	IW260	Spicer, Joseph
TMMK Assembly 1	IA840	Hensley, Darrell
TMMK Pool	IA740	ROARK, KEITH A.
TMMK Plastics	IRREB	MORGAN, STEPHEN A.
TMMK Plastics	IRREB	MORGAN, STEPHEN A.
TMMK Assembly 3	LA740	OWENS, BENNIE G.
TMMK Weld 2	MW160	FLODEN, JEFFREY
TMMK Assembly 1	IA825	Mulder, Mark
TMMK Weld	MW160	MORRISON, RICK
TMMK Assembly 2	Assembly 2	Lavoie, Todd
TMMK Weld 3	BODY WELD 2	Kirschner, Jessica
TMMK Assembly 1	IA840	Sills, Corey



# VMS Data Source

## VMS Data

Vehicle	Impact Date Time	Severity	Unlock Operator	Unlock Time	Locked Dur	Investigation Results	PIV Rule	Incident #
T109	Mar 16, 2021 3:46:10 AM	4 - SEVERE				Behavior	#9 Clear Path of Travel	
T070	Mar 16, 2021 6:55:40 AM	3 - HIGH				Behavior	Fundamental Skills	
T067	Mar 16, 2021 8:58:38 AM	3 - HIGH				Behavior	Fundamental Skills	
T064	Mar 18, 2021 12:30:12 AM	3 - HIGH				Behavior	Fundamental Skills	
T063	Mar 18, 2021 1:44:08 AM	3 - HIGH				Behavior	Fundamental Skills	
T064	Mar 18, 2021 1:52:12 AM	3 - HIGH				Behavior	Fundamental Skills	
T068	Mar 23, 2021 10:54:44 AM	3 - HIGH				Behavior	Passing #6	497493
T063	Mar 23, 2021 2:50:52 PM	3 - HIGH				Behavior	Fundamental Skills	497495
T116	Mar 24, 2021 9:23:54 AM	3 - HIGH				Material	Faulty Wheel	497550
T125	Mar 24, 2021 11:17:56 PM	3 - HIGH				Behavior	Fundamental Skills	497551
T117	Mar 26, 2021 11:42:54 AM	3 - HIGH				Behavior	Fundamental Skills	497634
F022	Mar 29, 2021 12:35:52 PM	4 - SEVERE				Behavior	Fundamental Skills	497662
T063	Mar 29, 2021 11:44:16 PM	3 - HIGH				Behavior	Fundamental Skills	497670
T105	Mar 29, 2021 11:51:28 PM	3 - HIGH				Behavior	Fundamental Skills	
T113	Mar 30, 2021 8:23:08 PM	3 - HIGH				Behavior	Fundamental Skills	
T055	Mar 31, 2021 2:11:08 AM	3 - HIGH				Behavior	Fundamental Skills	
T109	Mar 31, 2021 7:50:04 AM	3 - HIGH				Behavior	Fundamental Skills	
T109	Apr 1, 2021 1:04:34 PM	4 - SEVERE				Behavior	#9 Clear Path of Travel	
T063	Apr 1, 2021 6:58:08 PM	3 - HIGH				Behavior	Fundamental Skills	
T119	Apr 1, 2021 8:25:40 PM	3 - HIGH				Behavior	Fundamental Skills	
T116	Apr 2, 2021 9:44:34 PM	3 - HIGH				Behavior	Fundamental Skills	
T062	Apr 2, 2021 11:32:20 PM	3 - HIGH				Behavior	Fundamental Skills	
T070	Apr 5, 2021 6:38:22 AM	3 - HIGH				Behavior	Fundamental Skills	497817
T062	Apr 5, 2021 11:32:46 AM	3 - HIGH				Behavior	Fundamental Skills	
T148	Apr 6, 2021 12:12:02 AM	3 - HIGH				Behavior	Fundamental Skills	
T072	Apr 6, 2021 12:30:40 PM	3 - HIGH				Behavior	Fundamental Skills	
T072	Apr 6, 2021 3:01:54 PM	3 - HIGH				Behavior	PIV Spacing #4	497848
T144	Apr 6, 2021 6:48:18 PM	3 - HIGH				Behavior	Fundamental Skills	
T026	Apr 7, 2021 12:42:54 AM	4 - SEVERE				Behavior	Clear Path #9	497893

Safety Incidents are 'Paired' with VMS data

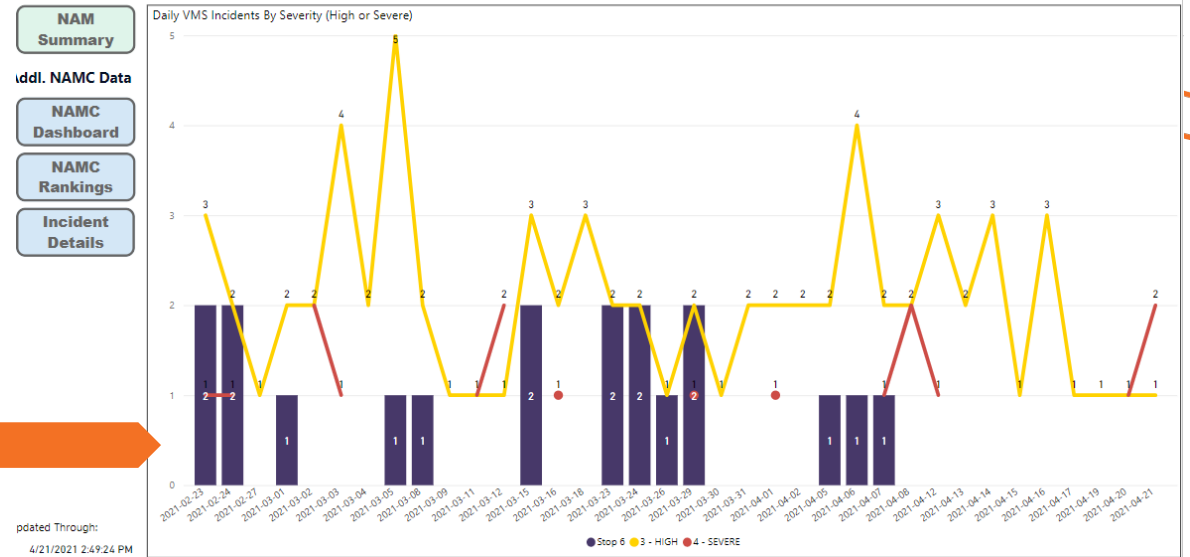


## PowerBI

### Daily VMS Incidents - TMMMS

Reporting Date: Last 2 Months (2/23/2021 - 4/22/2021)

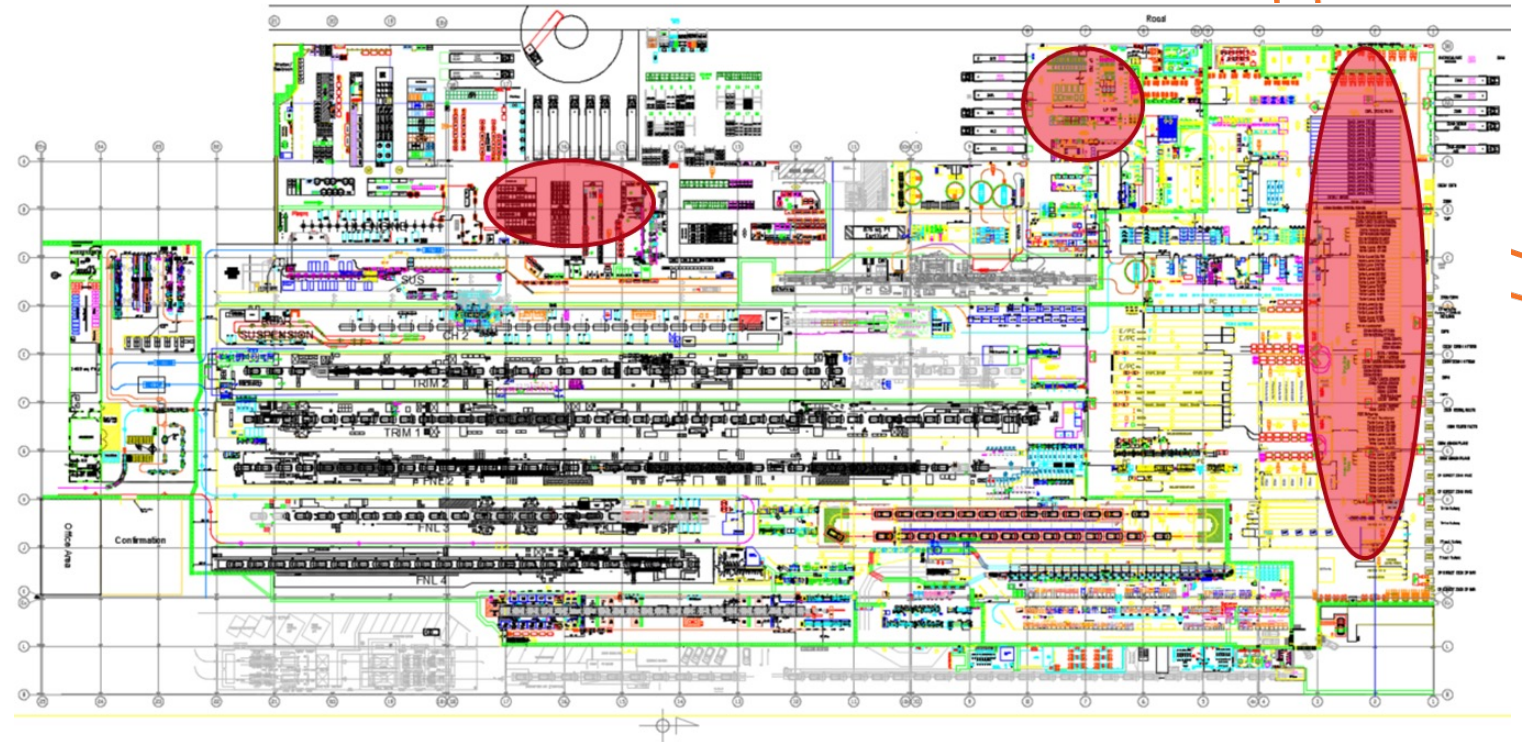
Plant: All Shop/Line: All Org. Code: All

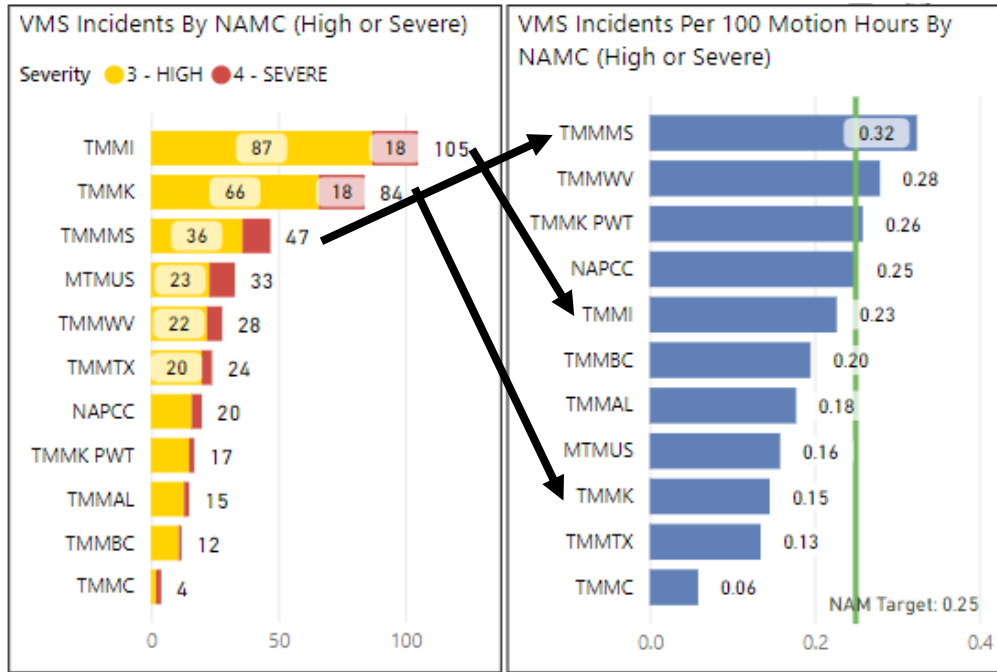




# Data Analysis – Problem Breakdown

- At a facility, the data revealed that 15 forklifts accounted for 60% of the impacts
- The process was dock loading / unloading
- The root cause was not following the fundamental skill of enter / exiting trailers at half-speed or less



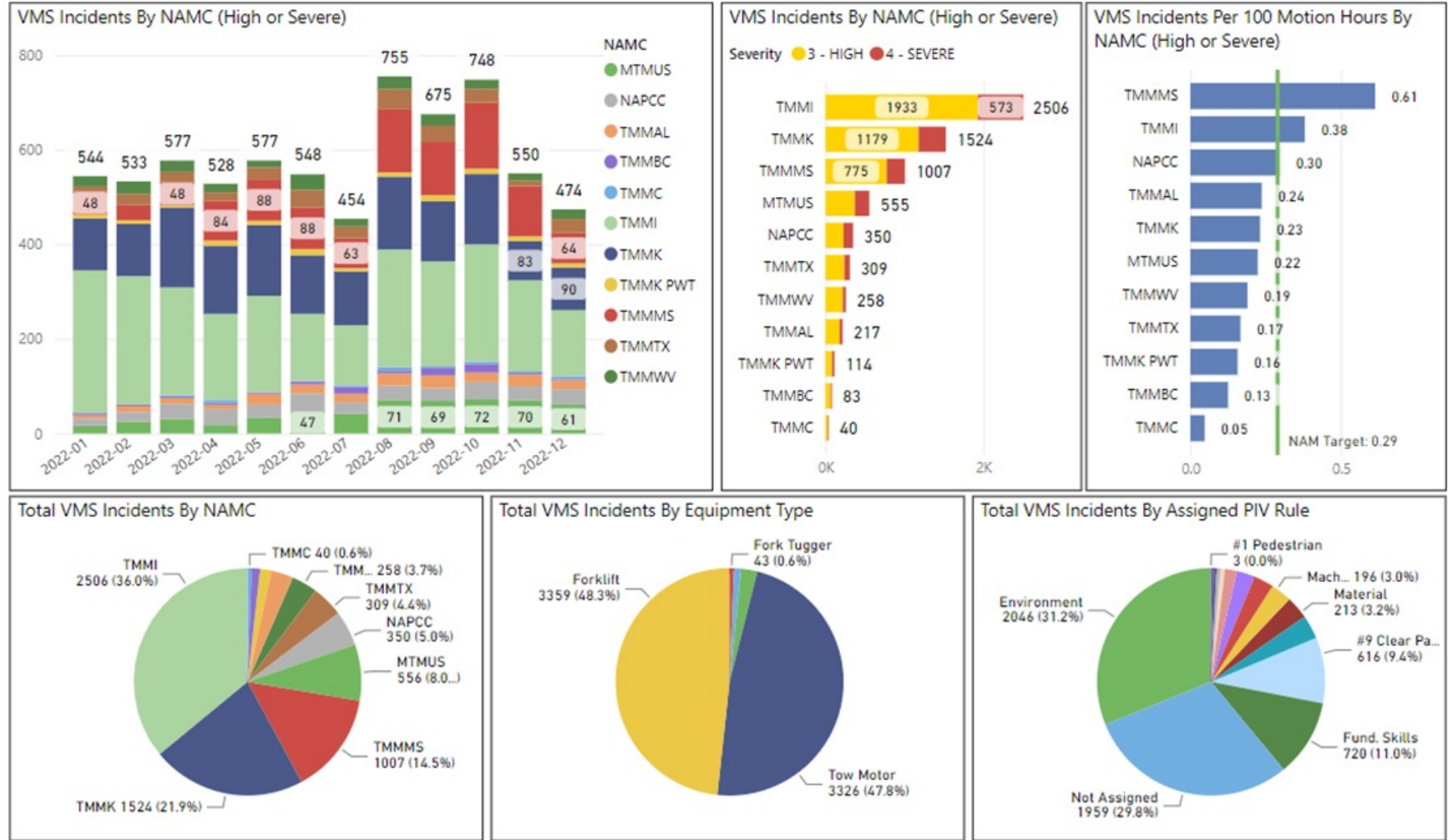


## Data Analysis – Problem Breakdown

- Created Key Performance Indicator (KPI) that ‘normalized’ the pace of events using motion hours
- $2 \text{ Incidents} \div 800 \text{ Motion Hours} = 0.25 \text{ Incidents per 100 Motions Hours}$

# Results

- Impact events and Impacts per 100 Motion Hours KPI were visualized and shared daily
- Last year we reduced High / Severe impacts by 25% compared to 2021



Thank you!

Questions or comments?

