Cargo Terminal

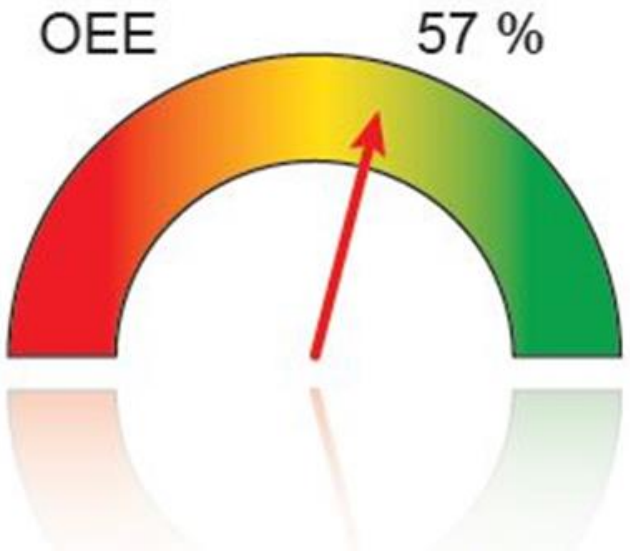
Overall Equipment Effectiveness

March 2023

Agenda

- ✔ About OEE
- ✔ Capturing and Presenting Data
- ✔ Root Cause Analysis
- ✔ What Data Should be Used
- ✔ Conclusions

TBA®
Simplifying your operation



Using OEE

OVERALL EQUIPMENT EFFECTIVENESS

A performance based KPI designed to measure Availability, Speed Loss and Output Quality of a process

- ✔ | Comparable across different sectors, operations and processes
- ✔ | Fully focused on losses
- ✔ | One figure connects all parameters
- ✔ | Understandable for operators
- ✔ | Operators can influence the outcome
- ✔ | Checks and balances are built in (No fudging...)

OEE Factors

Factor	Calculation
Availability	Actual Production time / Planned production time
Performance	Current run rate / Ideal run rate
Quality (optional for Terminals)	Product loss, safety & damage incidents
OEE	Availability X Performance X Quality

Bulk Terminal Vessel Discharge OEE Calculation

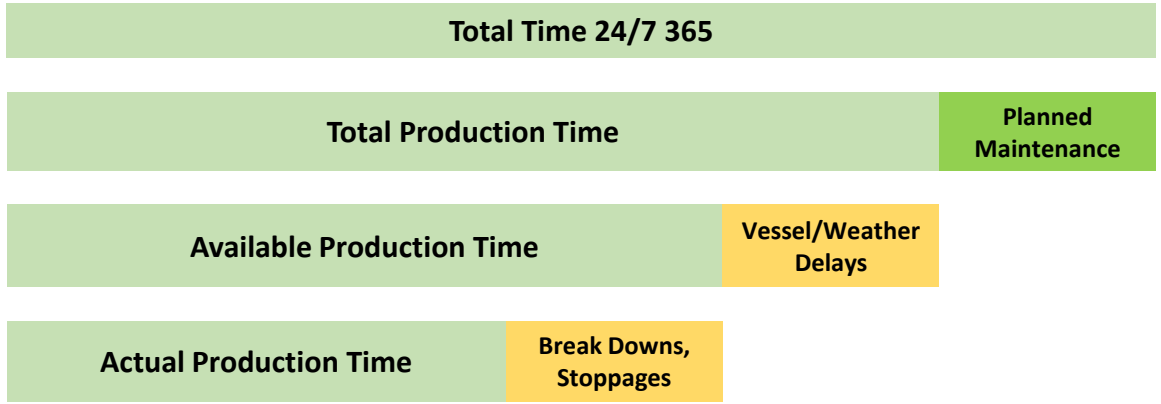
$$\frac{\text{Actual Availibility}}{\text{Planned Availability}} \times \frac{\text{Actual Tonnes Per Hour}}{\text{Design Tonnes Per Hour}} \times 100 = \text{OEE}$$

- Example:

$$\frac{\text{90 Hours}}{\text{96 Hours}} \times \frac{\text{960 TPH}}{\text{1500 TPH}} \times 100 = 60\% \text{ OEE}$$

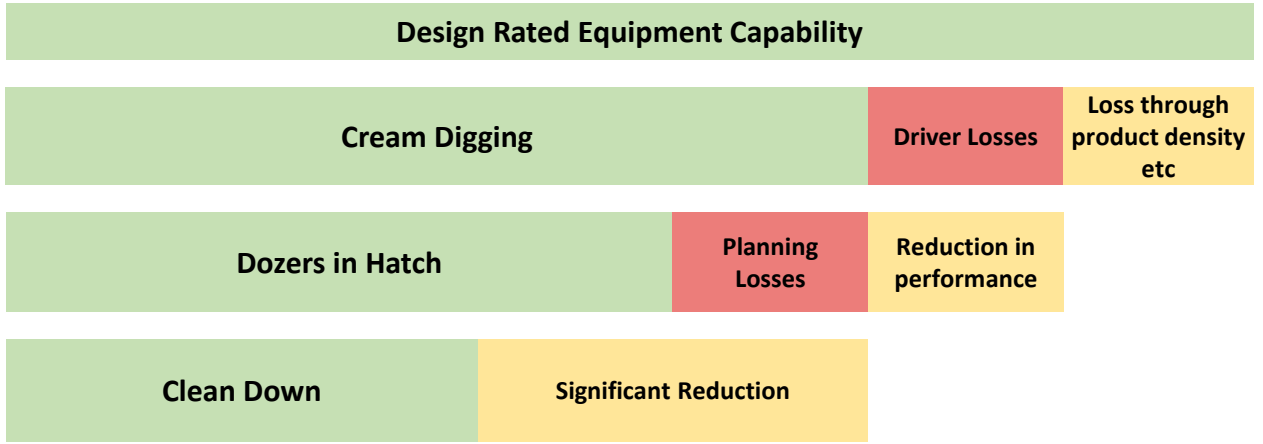
Availability

- ✔ | Terminal must decide as to 'what is available time'?
  - 24 x 7?, Vessel on berth, Vessel working?
- ✔ | Considerations:
  - Planned maintenance could be argued either way
    - Pro: Unreliable equipment can be identified
    - Con: The scheduled outage is a known factor and can skew actual OEE
  - TBA Suggest to Include ALL direct & indirect equipment delays (From NOR)
  - Indirect
    - Vessel & weather delays, hatch change, de-ballasting etc
  - Direct
    - Equipment breakdowns, unplanned maintenance



Performance

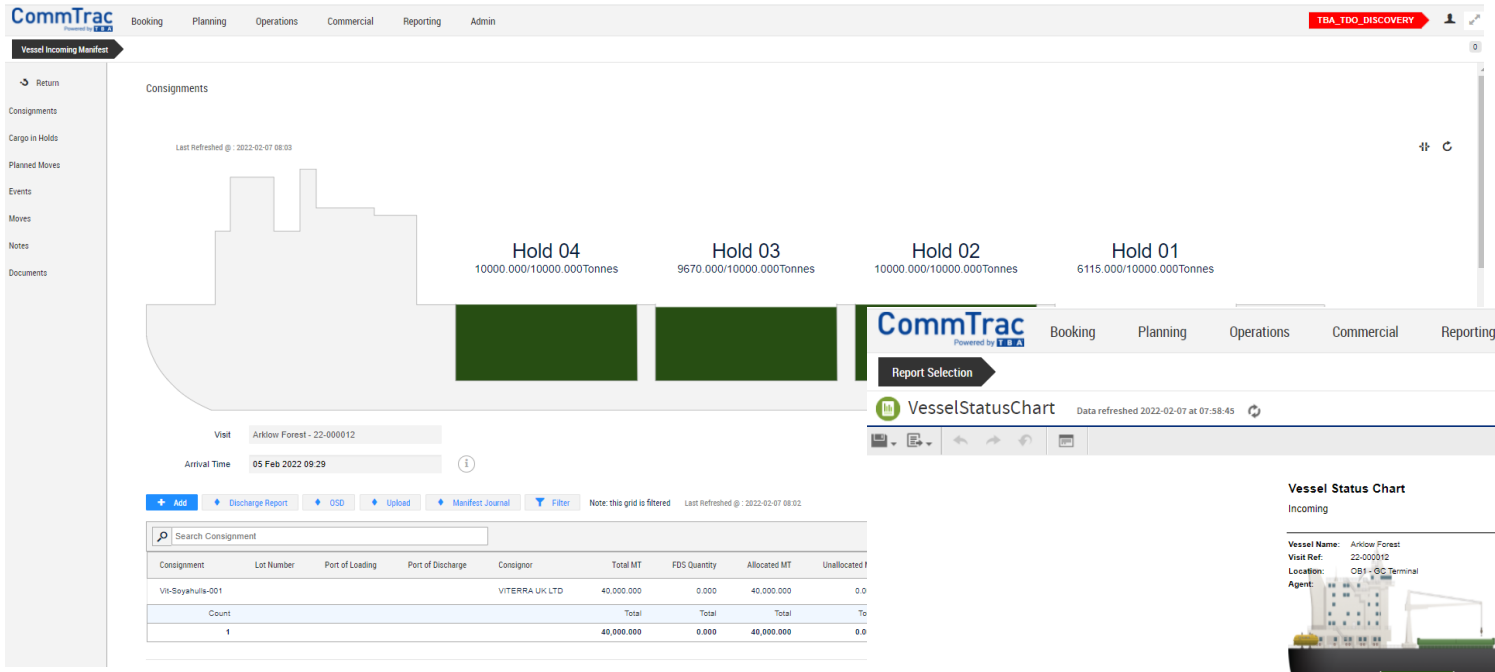
- Equipment will be design rated with specified tons per hour per commodity for optimum run rate
  - Terminal constraints could reduce the optimum rate but TBA recommend always using the design rate in order to aspire for optimum performance
- TBA recommends measuring Vessel Discharge overall rather than individual pieces of equipment

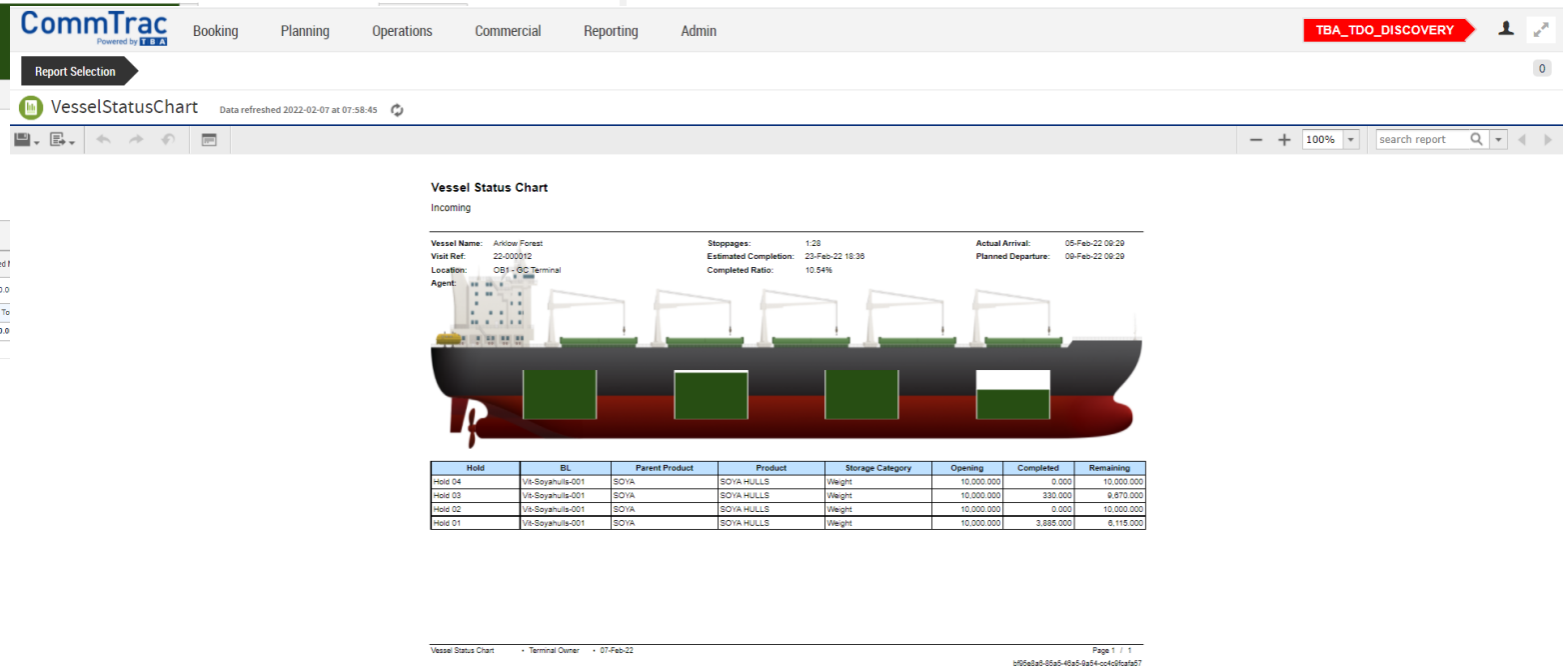


Capturing and Presenting Data

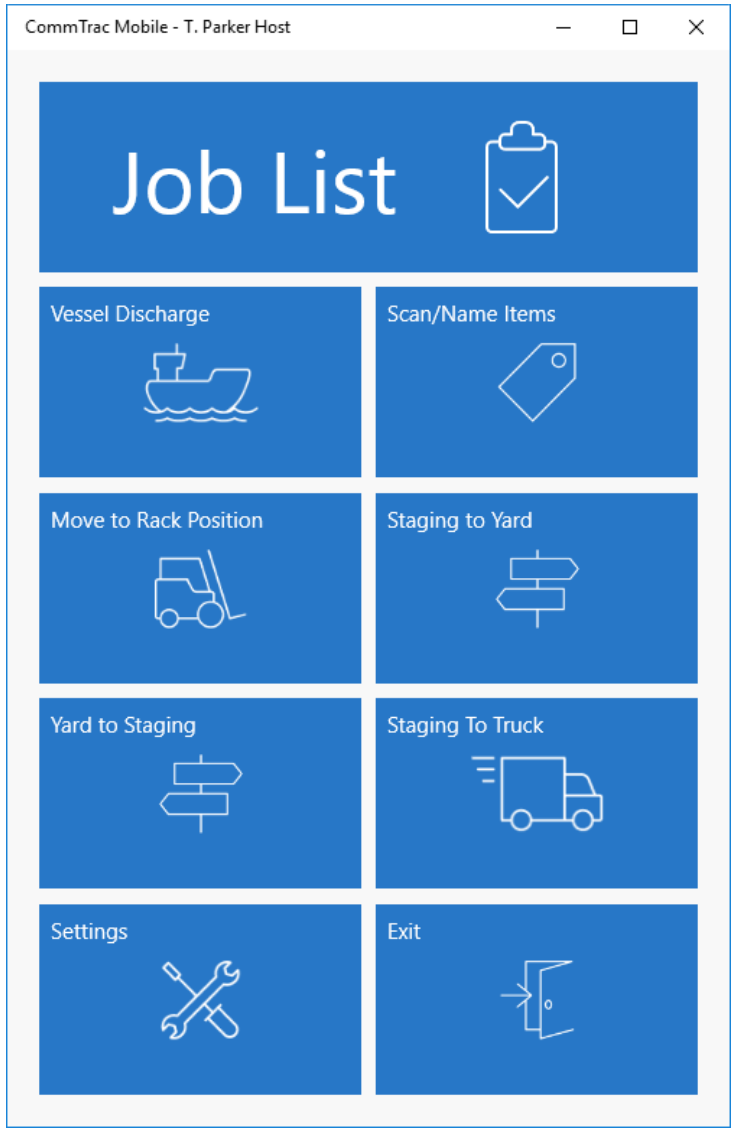
TOS allows users to see what is happing “in the now”

- ✔ Vessel unloading status in real time driven by data from the automation layer and from users entering data

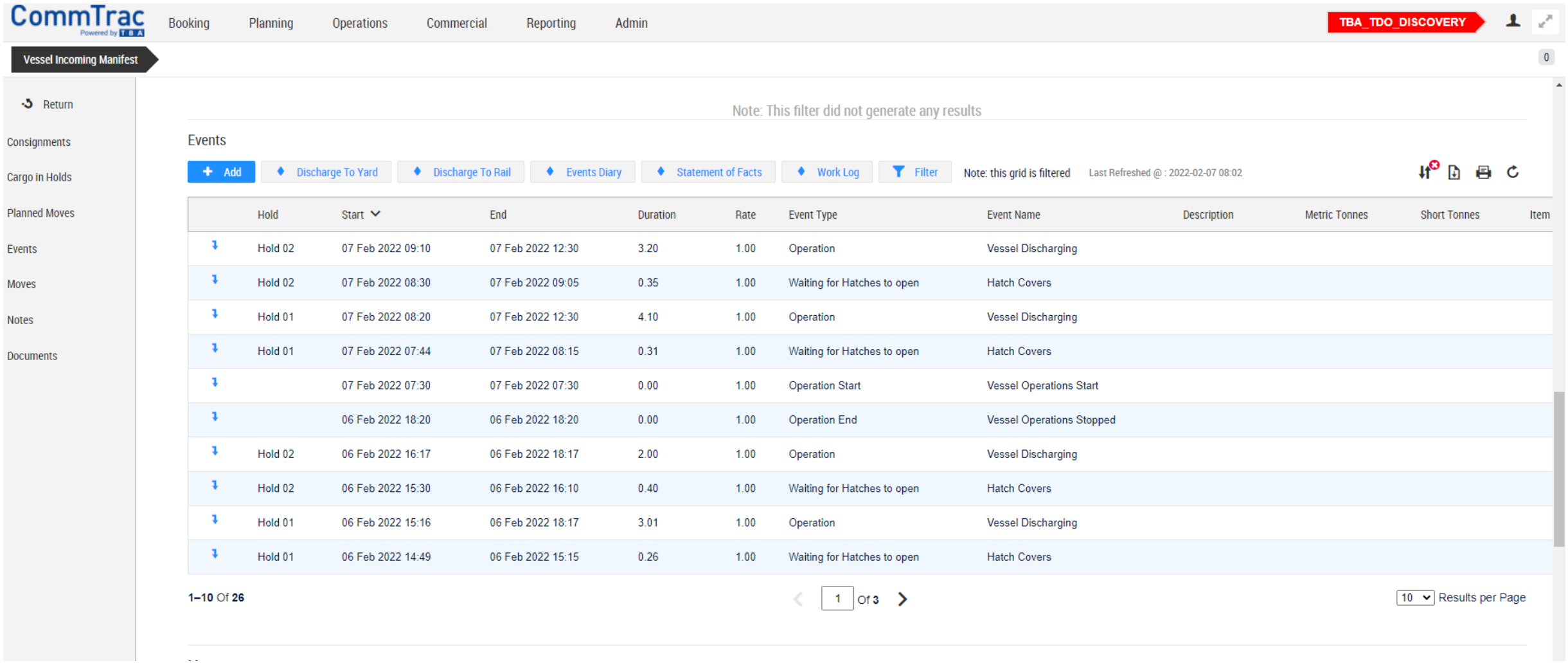




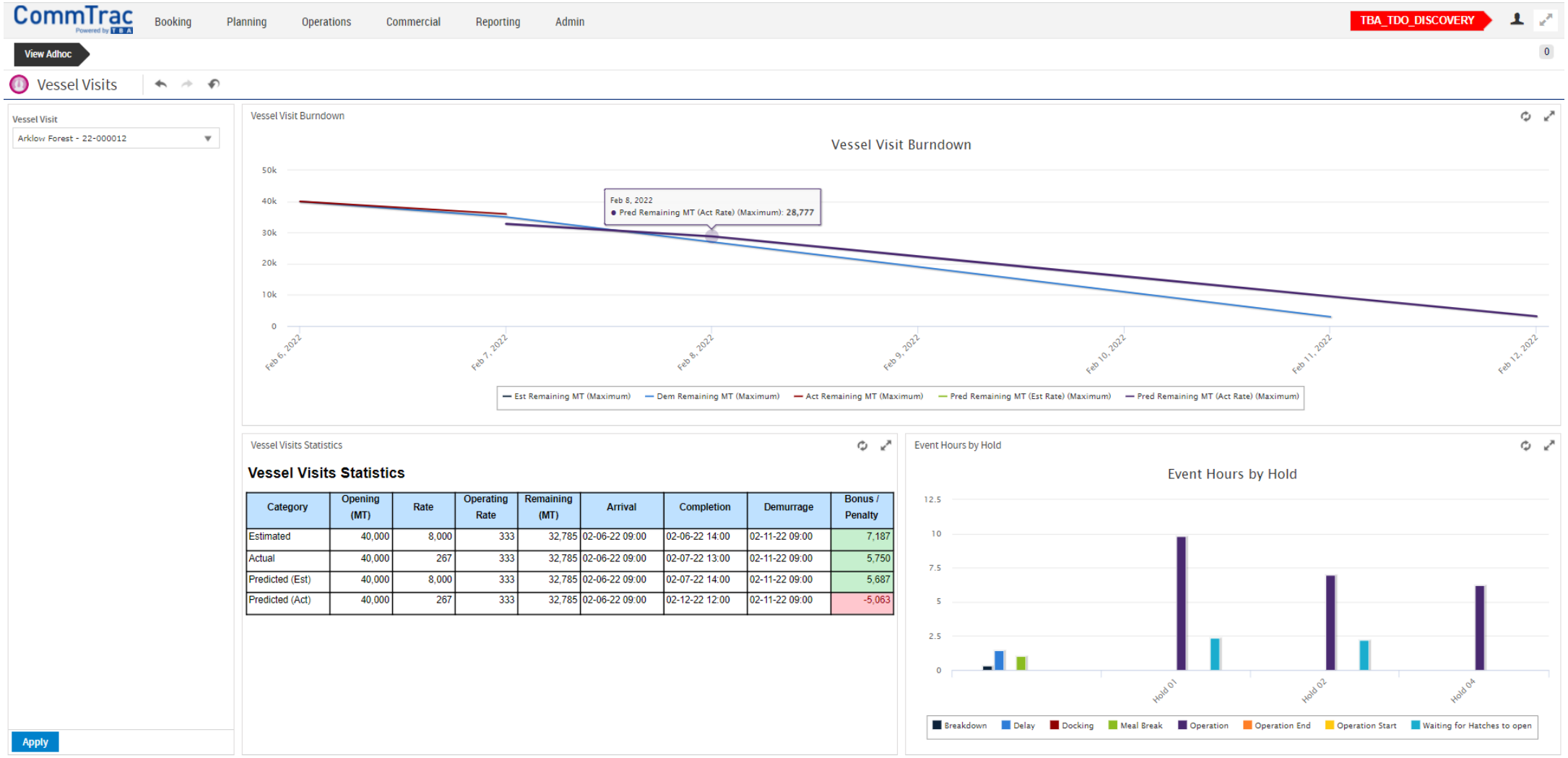
Mobile Application – On the ground data capture



Event Logging – drop down selections are essential



Real Time Forecasting allows better operational decision making



Category	Opening (MT)	Rate	Operating Rate	Remaining (MT)	Arrival	Completion	Demurrage	Bonus / Penalty
Estimated	40,000	8,000	333	32,785	02-06-22 09:00	02-06-22 14:00	02-11-22 09:00	7,187
Actual	40,000	267	333	32,785	02-06-22 09:00	02-07-22 13:00	02-11-22 09:00	5,750
Predicted (Est)	40,000	8,000	333	32,785	02-06-22 09:00	02-07-22 14:00	02-11-22 09:00	5,687
Predicted (Act)	40,000	267	333	32,785	02-06-22 09:00	02-12-22 12:00	02-11-22 09:00	-5,063

Delivering Value from “After the Fact” Reports and Analysis

Laytime

Customer:

			per Day	per Hour
Vessel Name:	Arklow Forest	**Demurrage Rate:**	4,500.00	187.50
Bill of Lading (MT):	40,000.000			
Operating Rate (MT per Day):	8.000	**Despatch Rate:**	1,500.00	62.50
NOR Tendered:	06-Feb-22 08:30			
Vessel Berthed:	05-Feb-22 09:29			
Operations Commenced:	06-Feb-22 09:41			
Time Starts to Count:	06-Feb-22 09:00			
Operations Completed:				
		Productivity Rates	**per Day**	**per Hour**
Time Allowed:	5000d, 0h, 0m	**Contractual:**	8.00	0.33
Adjusted Time Allowed:		**Adjusted Contractual:**		
Total Time Used:		**Average:**		
Laytime Used:	1d, 5h, 26m	**Actual:**	32,616.11	1,359.00
Time Gained:	4998d, 18h, 34m			
Despatch on Vessel:	7,498,160.416			

Event Start	Event End	Event Description	Event Duration	Cumulative Event Duration	Time to Count	Cumulative Laytime Used
06-Feb-22 08:30	06-Feb-22 08:30	First Line	0d, 0h, 0m	0d, 0h, 0m	No	0d, 0h, 0m
06-Feb-22 09:00	06-Feb-22 09:50	Removing Hatch Covers	0d, 0h, 50m	0d, 0h, 50m	Yes	0d, 0h, 50m
06-Feb-22 09:52	06-Feb-22 10:10	Hatch Covers	0d, 0h, 18m	0d, 1h, 8m	Yes	0d, 1h, 8m
06-Feb-22 09:53	06-Feb-22 09:53	Vessel Operations Start	0d, 0h, 0m	0d, 3h, 8m	No	0d, 3h, 8m
06-Feb-22 09:53	06-Feb-22 11:53	Vessel Discharging	0d, 2h, 0m	0d, 3h, 8m	Yes	0d, 3h, 8m
06-Feb-22 10:13	06-Feb-22 11:53	Vessel Discharging	0d, 1h, 40m	0d, 4h, 48m	Yes	0d, 4h, 48m
06-Feb-22 11:53	06-Feb-22 11:53	Vessel Operations Stopped	0d, 0h, 0m	0d, 5h, 30m	No	0d, 5h, 30m
06-Feb-22 11:53	06-Feb-22 12:35	Heavy Rain	0d, 0h, 42m	0d, 5h, 30m	Yes	0d, 5h, 30m
06-Feb-22 12:35	06-Feb-22 12:35	Vessel Operations Start	0d, 0h, 0m	0d, 5h, 30m	No	0d, 5h, 30m
06-Feb-22 12:36	06-Feb-22 13:10	Hatch Covers	0d, 0h, 34m	0d, 6h, 4m	Yes	0d, 6h, 4m
06-Feb-22 13:10	06-Feb-22 13:50	Hatch Covers	0d, 0h, 40m	0d, 7h, 42m	Yes	0d, 7h, 42m
06-Feb-22 13:10	06-Feb-22 13:48	Vessel Discharging	0d, 0h, 38m	0d, 7h, 42m	Yes	0d, 7h, 42m
06-Feb-22 13:10	06-Feb-22 13:30	Equipment Breakdown	0d, 0h, 20m	0d, 7h, 42m	Yes	0d, 7h, 42m
06-Feb-22 13:49	06-Feb-22 14:49	Lunch Break	0d, 1h, 0m	0d, 9h, 28m	No	0d, 8h, 28m
06-Feb-22 13:49	06-Feb-22 13:49	Vessel Operations Stopped	0d, 0h, 0m	0d, 9h, 28m	No	0d, 8h, 28m
06-Feb-22 13:49	06-Feb-22 14:35	Heavy Rain	0d, 0h, 46m	0d, 9h, 28m	Yes	0d, 8h, 28m
06-Feb-22 14:49	06-Feb-22 15:15	Hatch Covers	0d, 0h, 26m	0d, 9h, 54m	Yes	0d, 8h, 54m
06-Feb-22 15:16	06-Feb-22 18:17	Vessel Discharging	0d, 3h, 1m	0d, 12h, 55m	Yes	0d, 11h, 55m
06-Feb-22 15:30	06-Feb-22 16:10	Hatch Covers	0d, 0h, 40m	0d, 13h, 35m	Yes	0d, 12h, 35m
06-Feb-22 16:17	06-Feb-22 18:17	Vessel Discharging	0d, 2h, 0m	0d, 15h, 35m	Yes	0d, 14h, 35m
06-Feb-22 18:20	06-Feb-22 18:20	Vessel Operations Stopped	0d, 0h, 0m	0d, 15h, 35m	No	0d, 14h, 35m
07-Feb-22 06:15	07-Feb-22 12:30	Vessel Discharging	0d, 6h, 15m	0d, 21h, 50m	Yes	0d, 20h, 50m
07-Feb-22 07:30	07-Feb-22 07:30	Vessel Operations Start	0d, 0h, 0m	0d, 21h, 50m	No	0d, 20h, 50m
07-Feb-22 07:44	07-Feb-22 08:15	Hatch Covers	0d, 0h, 31m	0d, 22h, 21m	Yes	0d, 21h, 21m
07-Feb-22 08:20	07-Feb-22 12:30	Vessel Discharging	0d, 4h, 10m	1d, 2h, 31m	Yes	1d, 1h, 31m

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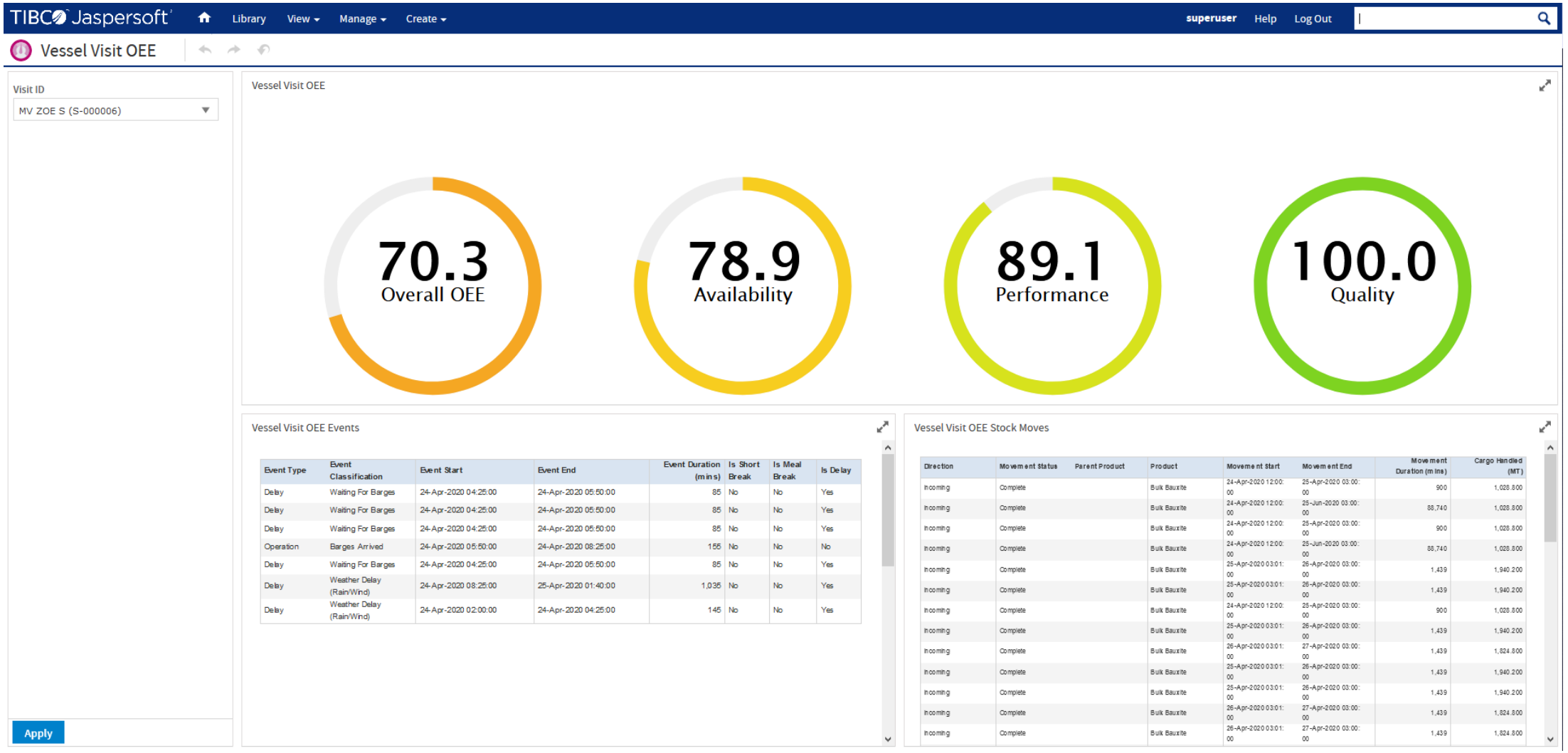
OEE Analysis Based on Same Data



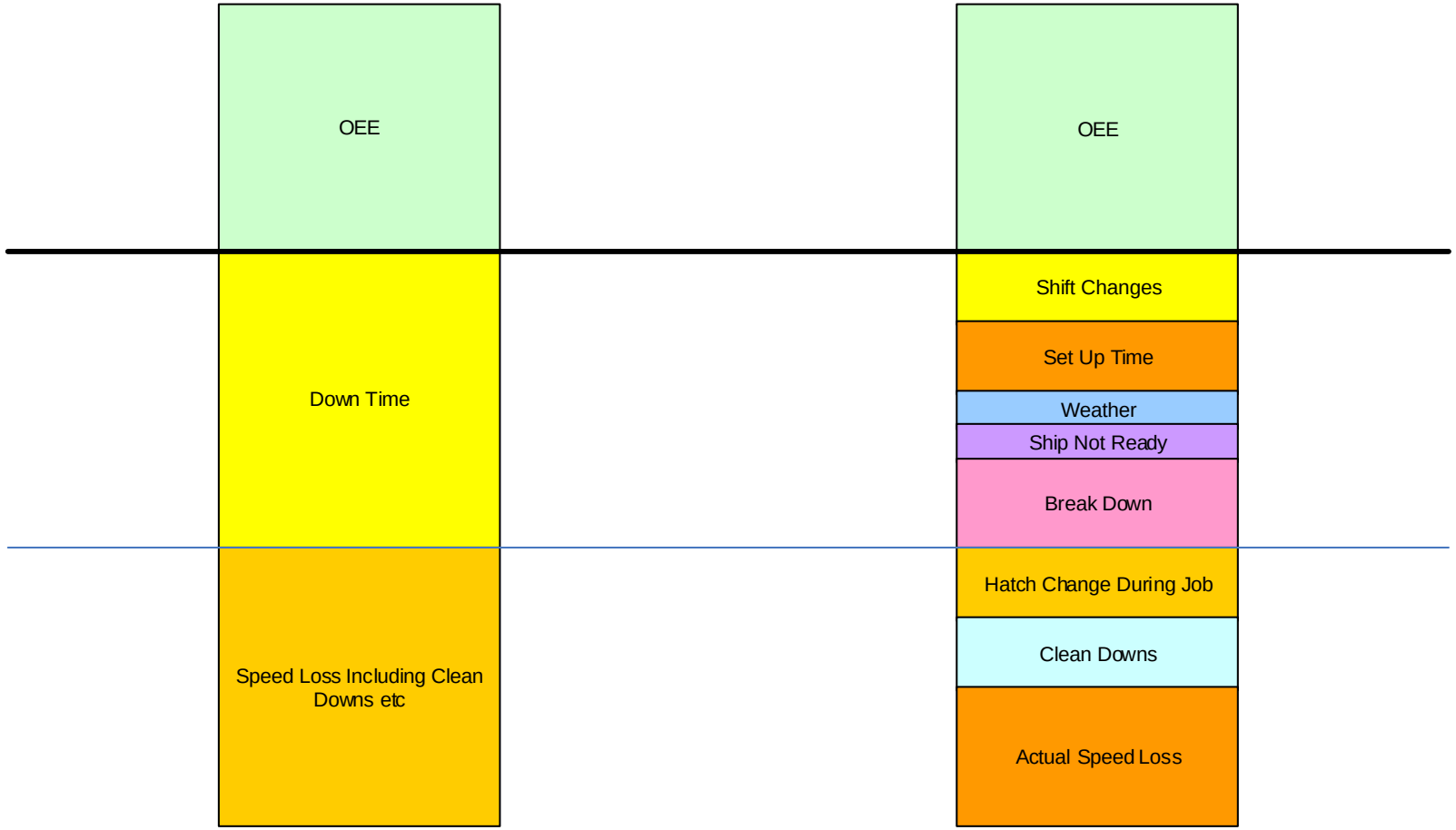
Root Cause Analysis

Root cause analysis

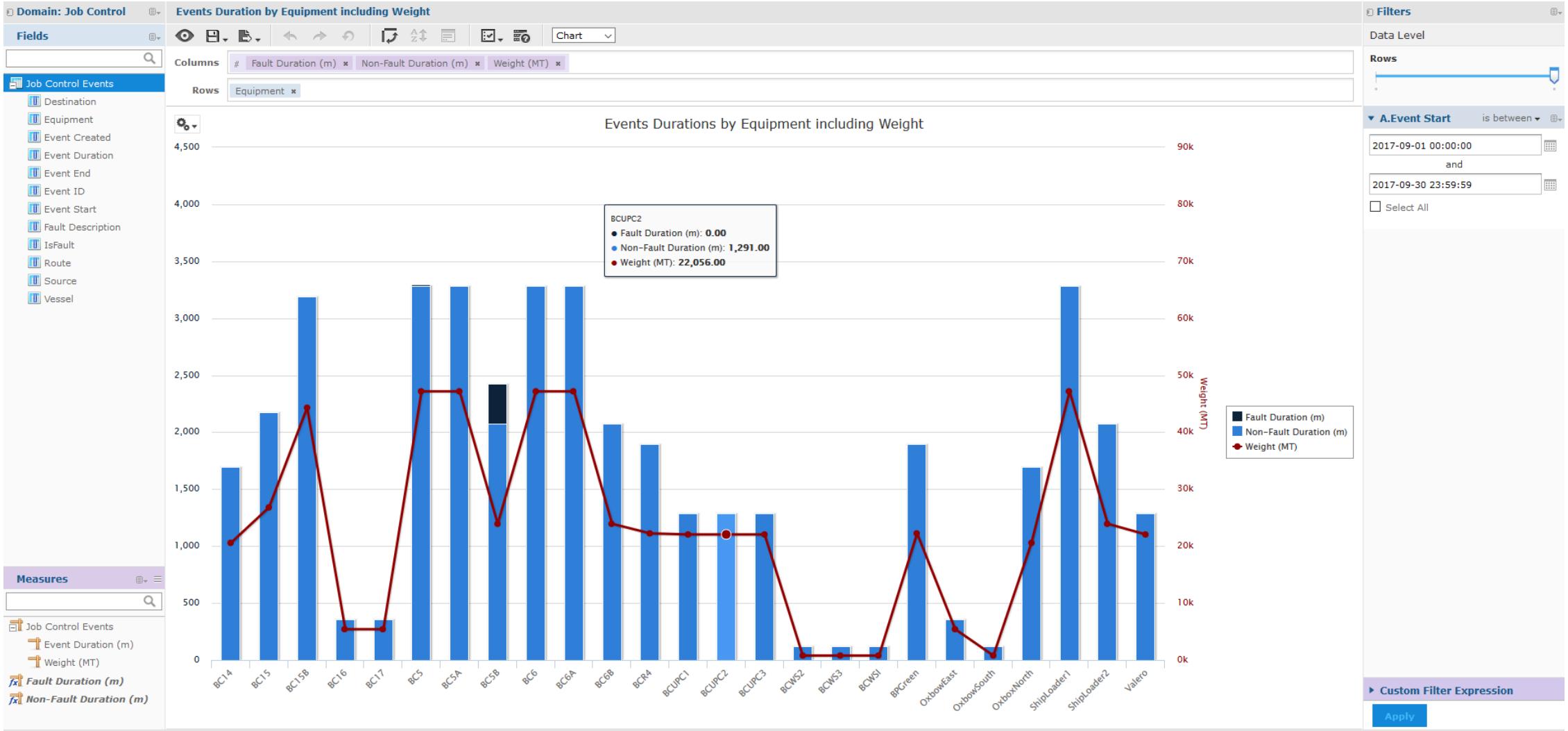
Knowing that losses are occurring doesn't improve performance

- ✔ | Analysis of the root causes of stoppage or speed loss is necessary for improvement to take place
- ✔ | "Low hanging fruit" needs to be targeted first
- ✔ | Focus on the largest causes of underperformance brings about the most significant gains

Peel the onion



Root Cause Analysis



Easy wins

- ✔ | Stop the feed not the conveyor system for minor stops
- ✔ | “Hot swap” at shift changes
- ✔ | Find the TPH bottleneck and remove it
- ✔ | Equipment checks during weather delays
- ✔ | Cream dig the next hatch whilst the dozers are cleaning up
- ✔ | Renegotiate rates on known bad ships or cargos

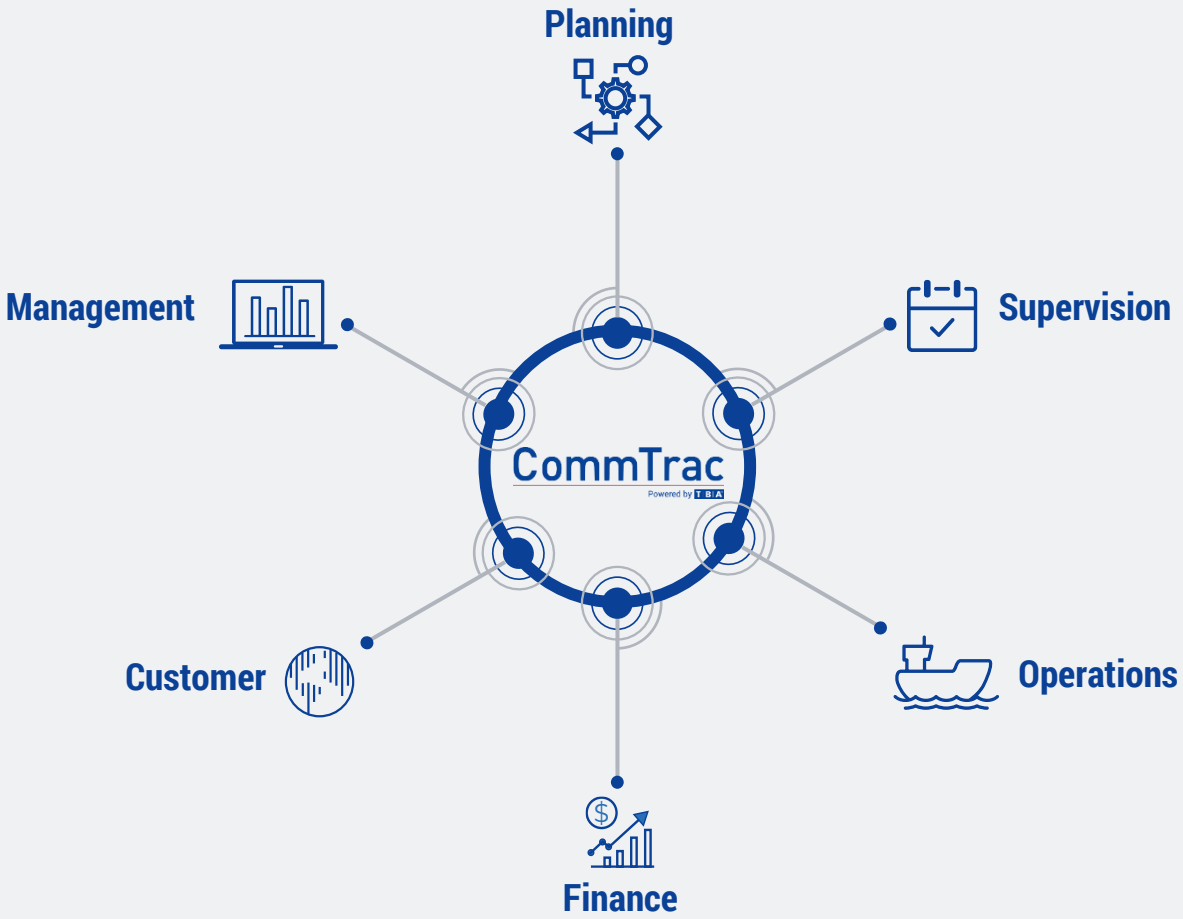
T | B | A®
Simplifying your operation

Trusting the data

Trustworthy data is essential to establish a true picture of operational losses

- ✔ | Not captured after the fact
- ✔ | Not handwritten
- ✔ | Not collected by 3rd parties (Independent superintendents)
- ✔ | Mobile applications can digitize traditionally manually capture data
- ✔ | System data, especially from the real time, automation layer is most effective

Integration for trustworthy data



Equipment Control
(SCADA)

ERP
Financials, Costs, CRM, Taxes

Measuring Devices
Weighing System, Barcode and RFID readers

EDI/Importer
Data Exchange via direct interface or excel Importer

Maintenance Systems
Permits, Work instructions

Customer Portal
Progress reports, Order booking, Stock levels

Conclusions

Summary

- ✔ | OEE and Root Cause Analysis are recognised, comparable methods to implement continuous improvement strategies
- ✔ | Using trustworthy data is essential if the results are to be trusted and improvement plans effective

- ✔ | Improvements in performance generally be realised in a series of quick wins and up to 10% improvements in efficiency followed by incremental gains over time
- ✔ | The P&L will be the ultimate KPI and provided the data is acted upon there will be an EBIT improvement in all cases

Thank YOU!

Questions?

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