

ELECTRIFYING THE FUTURE

Advanced Analytics Puts Our Haul Truck Drivers in the “Drivers Seat” of Safe Production and Operational Excellence

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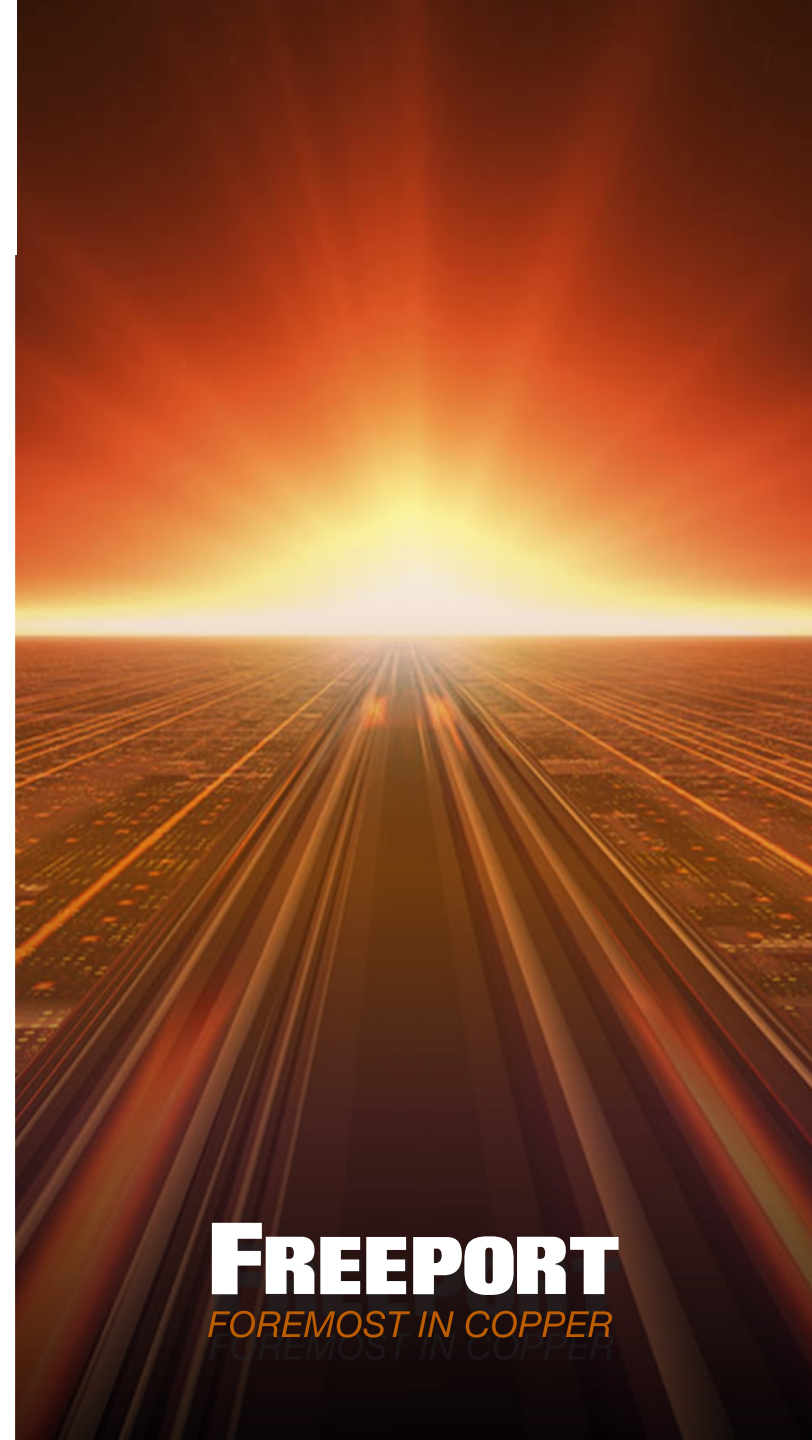
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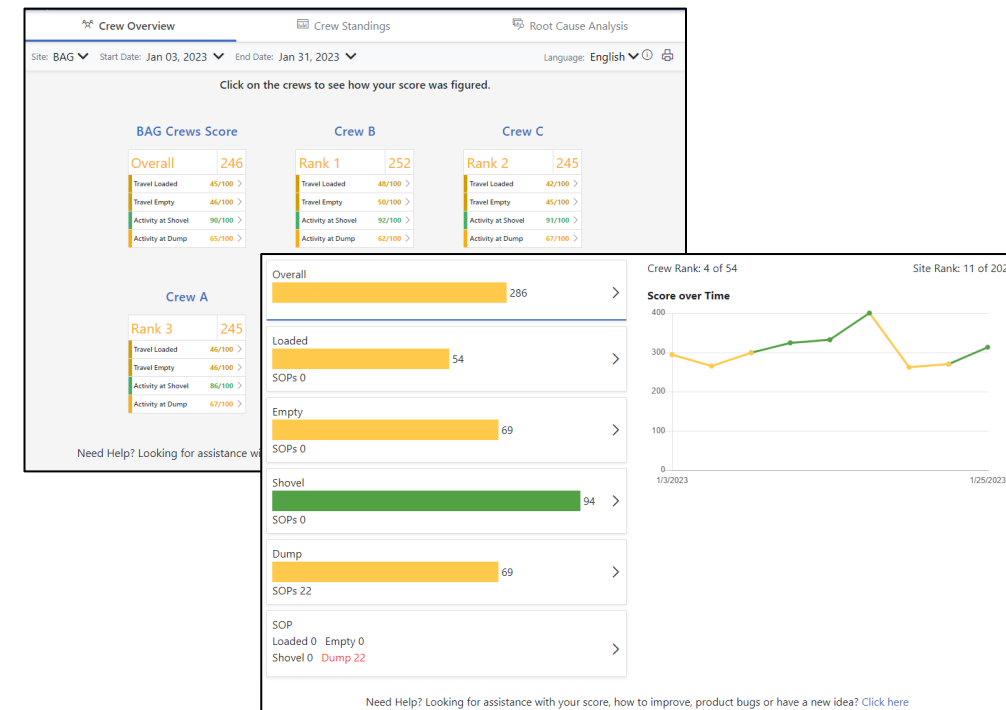
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Introduction

- Haul Truck Operator Scorecard (HTOS) leverages advanced simulation techniques to give operators data-driven feedback on specific things they control that align with best operating practices
- HTOS marries safety and efficiency into one advanced analytics tool for operators to gauge their own operating skills
 - We focus on safety in a new way that helps ensure our operators have the information needed to leverage safe performance under all conditions
 - An evolving organizational culture supported a change management approach that increased operator buy-in resulted in a better solution
- This presentation will describe how Freeport-McMoRan employees enabled the success of HTOS



Haul Truck Operator Scorecard (HTOS) completes the trifecta for world class performance

To achieve / maintain world class haul truck operations, Freeport must:

1. Ensure our assets are **mechanically available** for operation
2. Ensure those assets are **achieving max performance** while in operation
3. Ensure our operators **have the information to leverage that performance** under all operating conditions

Mechanical Performance

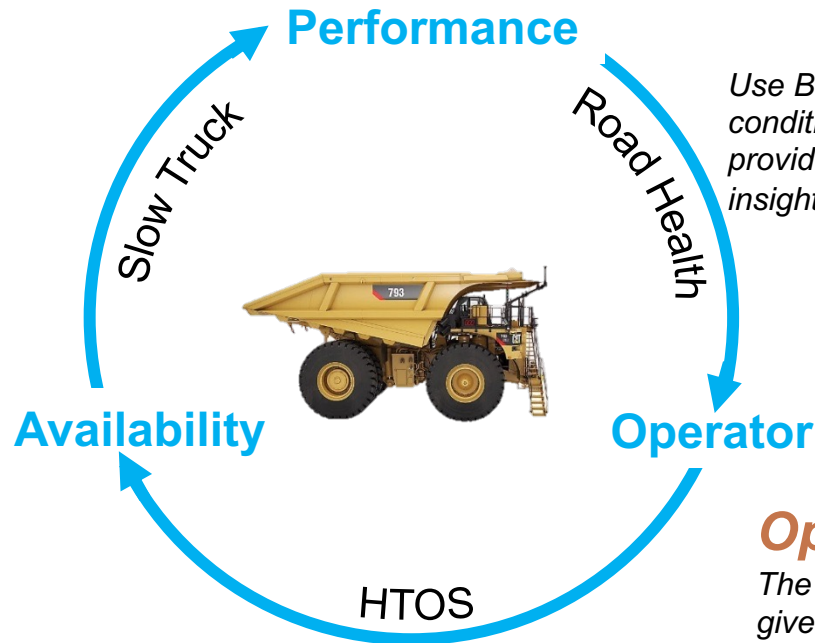
Use Big Data techniques to identify trucks that are slow due to mechanical issues.

Manage Operational Constraints

Use Big Data techniques to monitor road conditions, bunching, and weather to provide mine operations with actionable insights.

Mechanical Availability

Use Big Data techniques to use sensor data to identify trucks that have machine health issues.

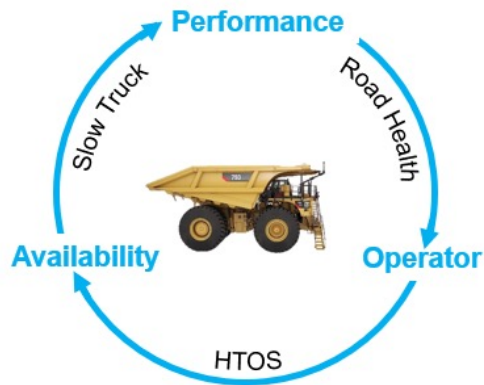


Operator Information

The Haul Truck Operator Scorecard gives haul truck operators feedback on the specific things they have control over which will affect haulage efficiency using data from sensors, alarms, and other enterprise systems.

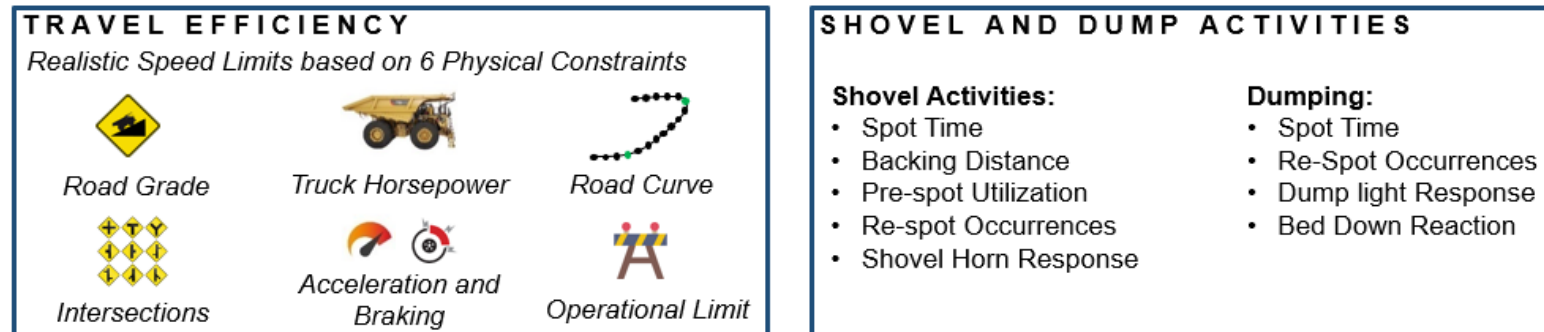
Data-driven solutions help us achieve these goals in new and dynamic ways

Haul Truck Operator Score Card (HTOS) focuses on what haul truck operator's control



Using Stream Analytics, Machine Learning, and Advanced Simulation Techniques

Haul truck operators get feedback on the specific things they have control over which will affect haulage efficiency



SAFE OPERATING PRACTICES

9 Existing RAMP
Operator Alarms

- Aggressive Spot
- Rocking the Load
- Traveling w/ Bed Up
- Operator Brake Temps



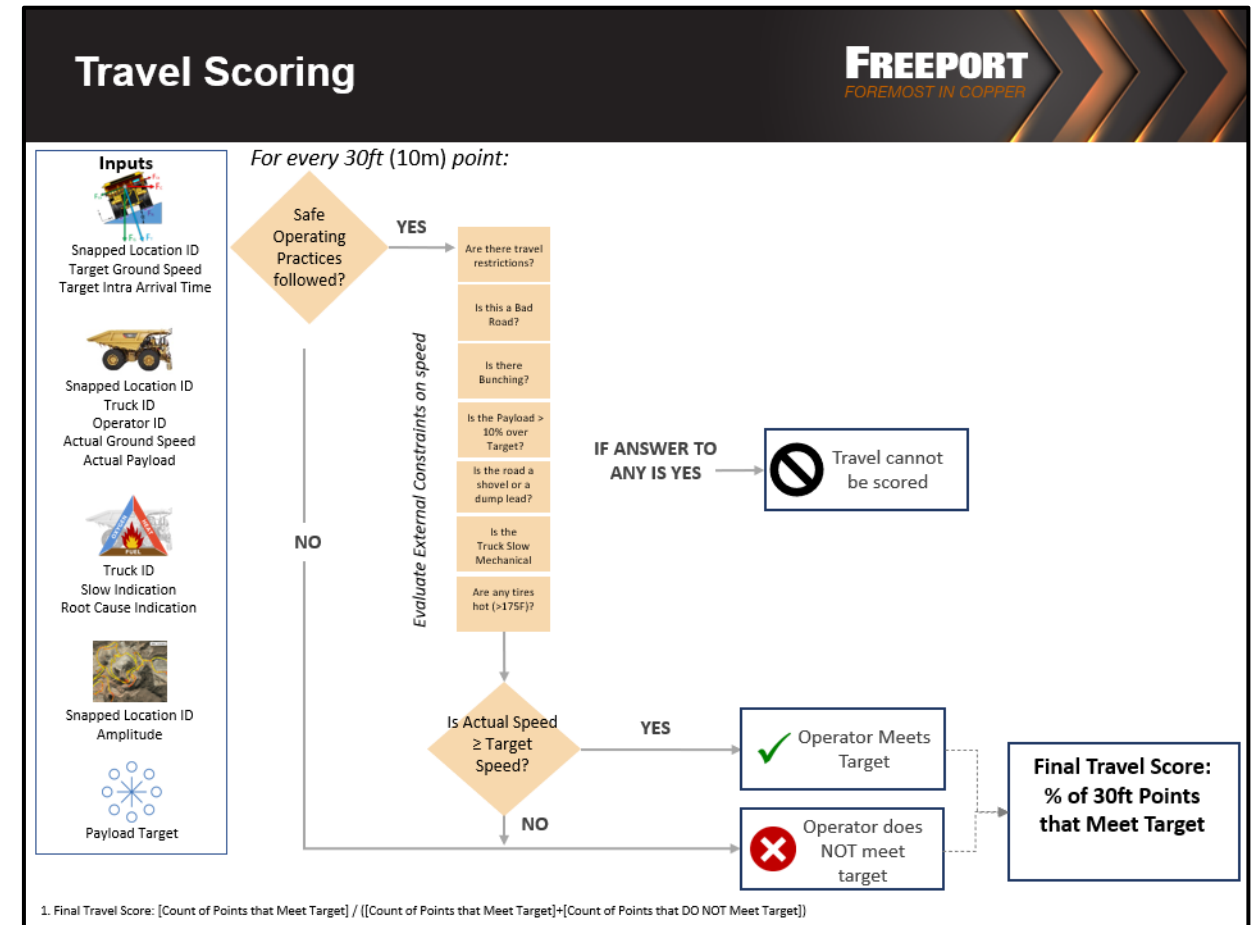
4 New UDE's

*User Defined Events

Safety is an Integral Part of Scorecard

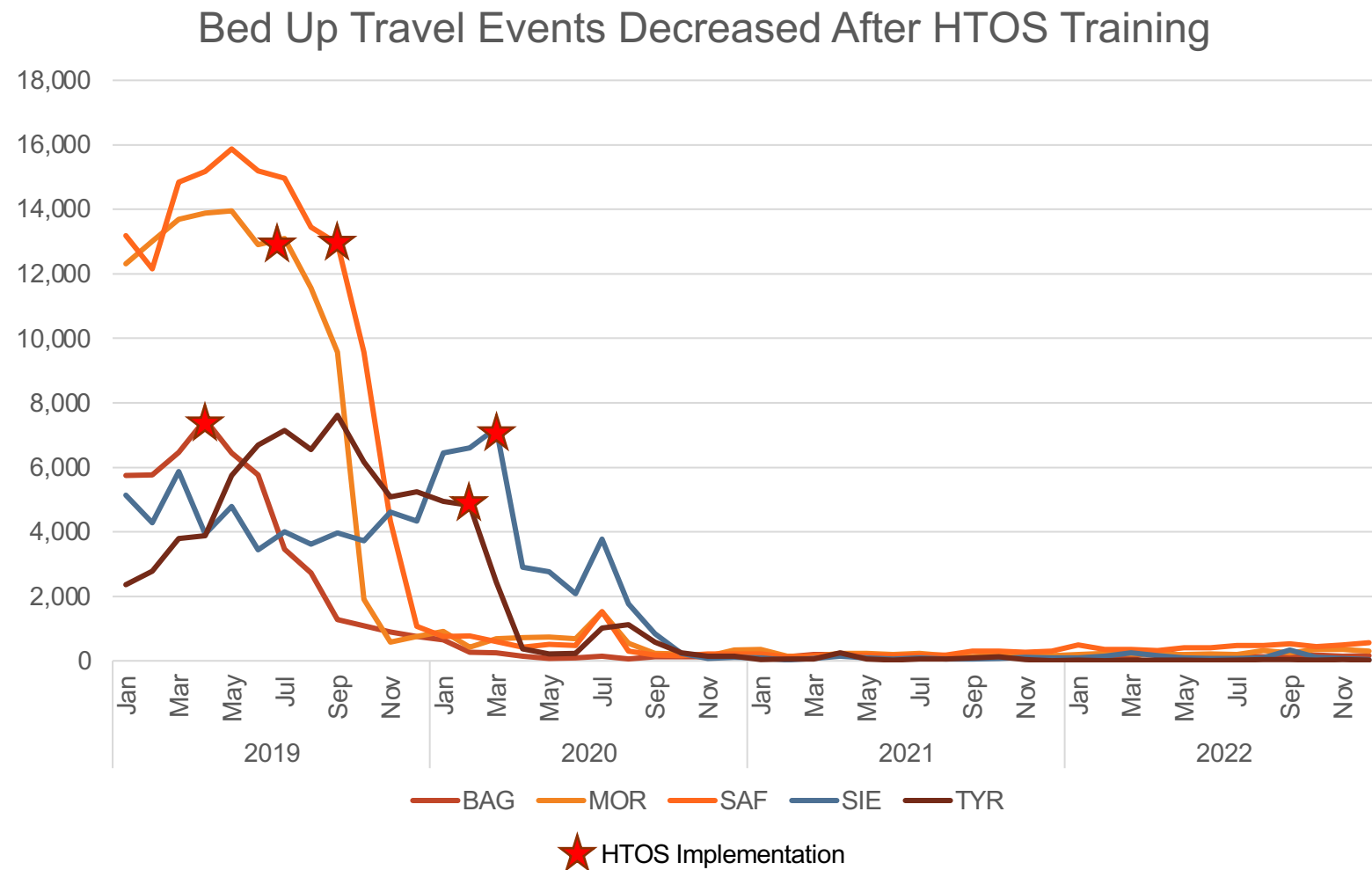
Safe Operating Practices

- An event or behavior that puts the health and safety of the operator or truck at risk
 - Defined using haul truck sensor data
 - Built into every aspect of HTOS and checked before evaluating whether the operator met the target



HTOS is Making Lasting Behavior Changes for a Safer Mine

- **Bed Up Travel:** A haul truck moving more than 30 ft or faster than 3.3 mph with the bed in the air
- Common behavior driven by old school “efficiency” thinking, but this practice is unsafe
- Refocusing operator efforts away from seconds saved to doing the right thing ultimately increased efficiencies



HTOS Drives a Decrease in Carbon Emissions



Efficiency Gains = Positive Carbon Impact



Operators are Key to Efficiency



Efficiency Savings Today Leads to Less Carbon Emissions in the Future

Tips for how you can increase efficiency and reduce emissions:

- ✓ Turn the truck off for shiftchange.
- ✓ Don't power down the bed, just relax and wait for it to come down naturally.
- ✓ Pre-spot whenever possible and safe
- ✓ Drive to take care of your truck and your tires to reduce need for replacement parts.
- ✓ Operate the truck to full potential to get the most out of the diesel.

HTOS delivered 167,000 metrics tons greenhouse gas emissions savings in 2021 and 2022.

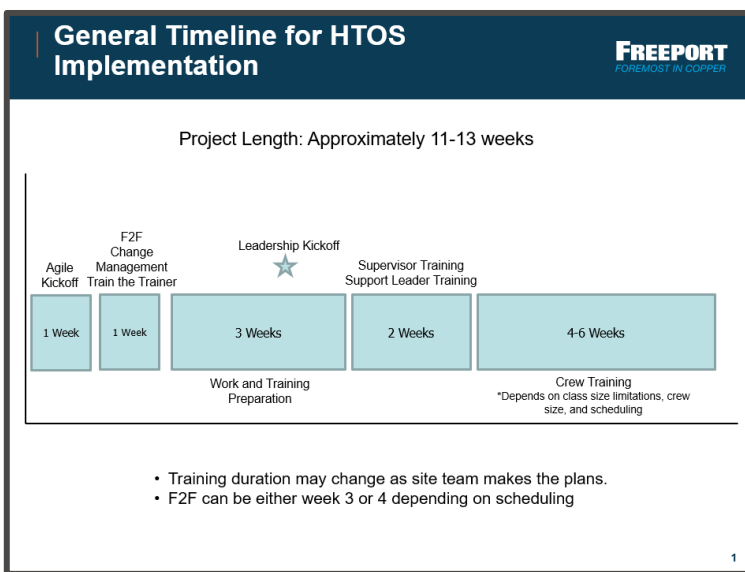


[FCX 2021 Climate Report on fcx.com](https://www.fcx.com)

Changing How we Change our Operations

A robust change management strategy from first contact all the way through sustainment enables the success of HTOS

Longer implementation timeline of 12 weeks with team support vs. 2-day handover model



Elevator Pitch

To escape our high cost producer status (4th quartile) and become secure in our future, New Mexico Operations must become more efficient in everything that we do. One of our largest costs is mining haulage. Haul Truck Operator Scorecard (HTOS) gives us the opportunity to lower operating costs and drive efficiency. Efforts to transform our culture are ongoing. This has the opportunity to have a positive impact on our sites and our community.

HTOS will help develop and sustain a safe workforce that continuously grows through self-driven development, meaningful and constructive feedback, and a transparent means of tracking individual skills. It does not encourage or reward unsafe behaviors and driving faster is not what we are asking. HTOS focuses on achieving the specifications of the equipment in a safe manner and adhering to the site specific travel limitations. The application has an easy to use interface accessible from anywhere. It is an accelerated way to build skill and efficiency to help our operators use the haul truck to its design capabilities. This will be instrumental in reducing maintenance costs.

NMOPS has already made significant strides to start moving the needle with all the transformation work at both sites. We have made substantial gains by the implementation of side-slope leaching, plant modernization and dig-face to process optimization. HTOS will add to these gains and drive us towards being a lower cost producer (3rd quartile). Can you support us in using HTOS to help us achieve our best day every day and our vision?

Working together - Living our values - Spanning generations - Everything I do matters

Customized messaging to fit site needs and personality vs. one size fits all

Site team leads implementation with input from development team vs. development team leads

HTOS Product Team

Change Coalition: Casey Clayton, Chris Unger, Drew Borchering, Justin Bingham (Training Superintendent), Buck Umphreys (Mine Superintendent), Gary McKinney (Mine/Maintenance Superintendent), Gary Anderson (Incoming Maintenance Superintendent), Bret Hunt (Product Owner)

Executive Sponsors: Cory Stevens, Bert Odinet, Jeff Monteith

IT Sponsor: Scott Birmingham, Robert Catron | **Business Sponsor:** Paul Gelfi | **Innovation Project Owner:** Nick Hickson

Role	Person	Percentage	Team
Product Owner	Bret Hunt	50%	Safford Team
	Nick Hickson	30%	Core Team
Innovation Engineering	Raquel Crossman	100%	
	Garrett Anderson	100%	
	Mega Golden	45%	
	Chris Apodaca	45%	
HTOS Core Data Support	Tommy Ward	100%	
	Pradeep Gaur	100%	
	Maresh Reddy	100%	
Onsite Safford Team	Bleu Wear	100%	
	Mara Anderson	100%	
	Frankie Cordova	100%	
	Brian McLinn	100%	
	Robbie Garcia	100%	
HTOS Core Training	Kyle Lackner	100%	
	Ruben Trujillo	100%	

Training Trailer Room #1

Team Revolution

Leadership must provide consistent



Sustainability Requires as Much Work as Implementation

The work doesn't stop because implementation is complete. Sustainability work is often overlooked but will be the largest amount of time spent on the project.

Key Ideas for Sustainability:

1. The solution is never finished or perfect
2. Do not discount feedback and listen for the core pain points
3. Prioritization is key – there is always work to be done and resources are always limited
4. Regular improvements will increase buy-in
5. Nothing replaces a one-on-one interaction to answer questions and dispel misconceptions

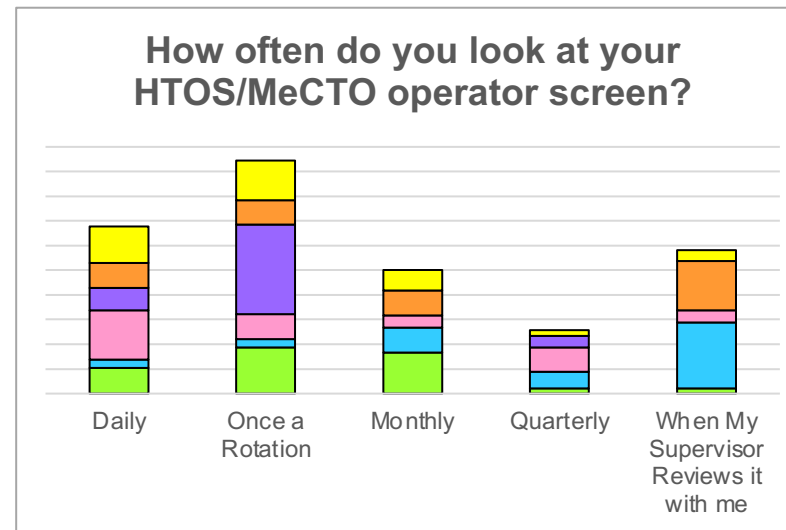
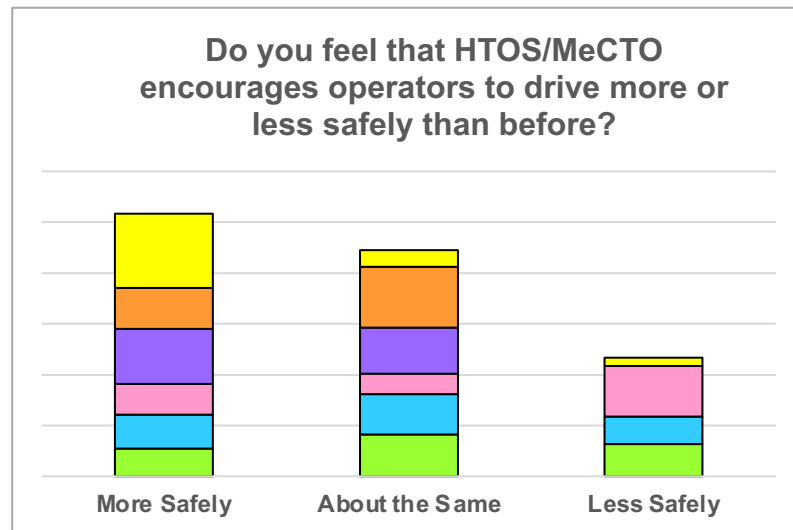
Freeport Adopted the Enterprise Product Management Framework to Sustain our Digital Solutions

- Enterprise Product Management (EPM) teams build capabilities that support, develop, sustain, and mature our critical solutions
- Cross-functional teams work together to create and communicate the vision and direction
- Utilize agile practices to manage the work and team

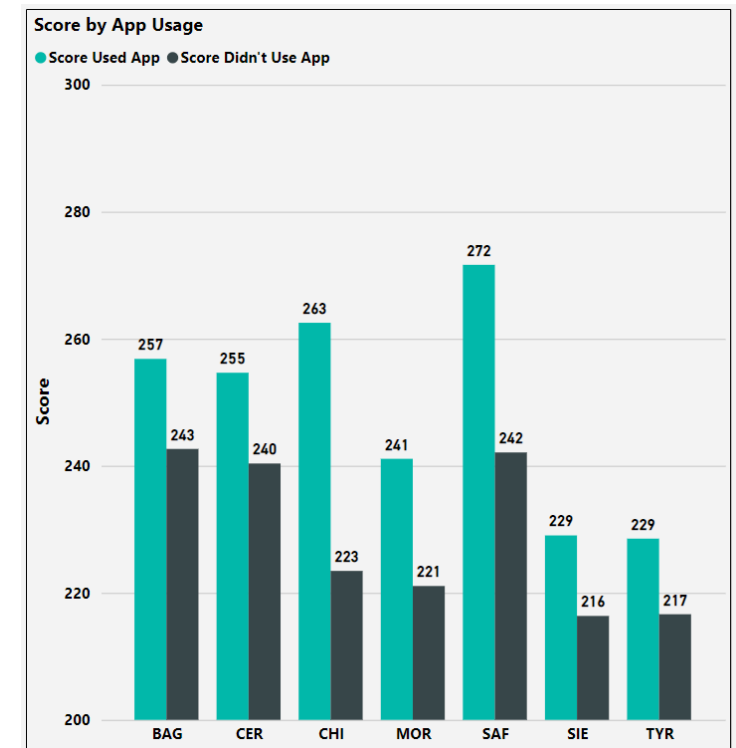
Lead Team	Enterprise Product Owner		Business Lead
Technical Support	Data Science	Data Engineering	Custom Solution Support
Site Lead and Support	User Advocates	Process Leads	Subject Matter Experts

The Coolest Tools Do Not Provide Value Without Employee Use

- Development and sustainment focus on the needs of the user (not leadership)
- Addressing pain points and fixing bugs motivates users to continue to use the solution or to give the solution another chance
- Regular check-ins are required to determine if HTOS is still meeting user needs



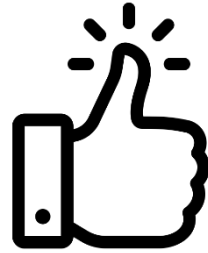
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Two Types of Feedback Receive Most Attention...

Positive Feedback:

- Preferred type of feedback
- Short with key phrases
- Aligns with solution messaging



Gives drivers opportunity to shine, identifies key areas of opportunity for drivers

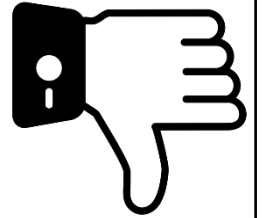
The purpose to become a better and safer operator

Positives are accountability, knowledge on performance, motivated to be a better driver.

Helps operators improve in different areas

Negative Feedback:

- Is not fun to receive
- Short with no specific issues



Why are we using a system that's broken

The HTOS gives the operators free reign to abuse the trucks, safety and truck health are ignored.

Careless drivers

Implemented before 95 percent accuracy is reached

A Third Feedback Type Provides the Most Value to the Solution

Improvement Feedback:

- Can often sound like negative feedback
- Powerful insight into improvement opportunities
- Provides examples of issues and why
- Should raise questions for supporting team

When **bad weather** hits, if one driver is driving faster than other drivers, all drivers lose points. So, if you want a better score on a bad weather day, **you either keep up or just decide to lose the points for the shift**, which is the case for most of the drivers.

Can we improve scoring during weather?

The accuracy in scoring... It seems that with one lower score the drop is drastic, but when a driver scores really high it doesn't recover in the same manner it drops. The difference is greater with a higher score. Negativity stems from the inaccuracy in HTOS. It is not all that they said it would be. It is a newer system, but there are bugs that need to be worked out. If **one or two trucks slow down, no matter where in the mine, it should reflect bad road conditions** or send a message that dispatch can answer as to why those trucks are slower. The system then can reset to not score on travel time, **mechanical issues, weather, roads conditions, hot tires or other reasons.**

Are we missing locations with bad roads?

Training isn't utilizing HTOS properly. It's designed to help operators operate better, not force them to run how they say to boost production. The training department in Bagdad reports that Caterpillar says they can **run these pieces of equipment above original design specs but** hasn't shown an ounce of proof behind these statements. Comparisons between sites is unfair due to material type, grade %, different maintenance practices, and different training protocol. Training doesn't seem to take any responsibility for the damage being done to equipment from **excessive brake temps and overload running**. Operators are trying to find ways to meet expectations but cut corners / abuse equipment to give training what they desire. It's all numbers to them, not the cost to repair damages in the end. Training points the finger at maintenance, maintenance points the fingers at ops, ops points the finger at training. Its a never-ending cycle. **We have had blown engines due to operators driving through stage 3 alarms in order to make good time for their HTOS score,** instead of abiding by the basic rules.

Can we provide better documentation of speed targets?

How do we flag these behaviors to discourage them in the future?

The Work is Ongoing...

- We continue to refine the HTOS digital solution as our teams mature.
- We are constantly learning how to better meet operator and business needs.
- We drive impact, performance and sustainability with clear measurements of value.
- HTOS supports Freeport's Environmental, Social, and Governance stewardship objectives and roadmap.
- We leverage data driven innovation to use millions of data points to disrupt the haulage space, unlocking the equivalent of 43 haul trucks in additional haulage capacity.

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**TEAM
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