MOTION METRICS[™]

Using Al-enabled machine vision coupled with a payload monitoring system to influence shovel productivity

Mining technology for a sustainable future

By Will Brentson



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About Weir Motion Metrics



MOTION METRICS[®]

About Weir Motion Metrics

Founded in 2004 and acquired by the **Weir Group** in 2021, **Motion Metrics** provides smart computer vision systems that help mines operate more safely and sustainably.

We build and install rugged machine vision systems at mines worldwide, then **use AI to turn** that video **data into actionable insights** that save lives, improve efficiency, and boost productivity.



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SHOVELMETRICS[™] GEN 3

A complete bucket monitoring solution for all shovels and excavators.

ShovelMetrics[™] uses deep learning to improve safety, energy efficiency, and productivity.



MOTION METRICS[™]

ShovelMetrics[™] Gen 3

Features & Hardware

Features

- Payload monitoring
- Missing tooth detection
- Missing lip shroud detection
- Missing wing shroud detection
- Tooth wear monitoring
- Boulder detection
- Fragmentation Analysis
- Blind spot reduction
- Video recording





Installations & Components

ShovelMetrics[™] Gen 3 – Payload Monitoring



Payload Monitoring Instrumentation & Mounting Locations

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CORE Processor & Display



1x Control Unit



1 x Boom Orientation Sensor



1 x Stick Orientation Sensor w/ Splitter



1 x Rugged Bucket Orientation Sensor & Cable



2 x Pressure Sensors and Adapters



What does 8% productivity to your shovel or excavator fleet mean to you?



Establishing New Targets to Maximize Productivity

What Fragmentation Characteristics Will Result in Maximized Productivity?





Partner Mine Case Study

South American Copper Mine

Study Parameters

- 3-phase study conducted with partner Copper Mine in South America
- Study focus: existing installation on CAT 6020B
- Phase 1: Evaluate SM-PLM performance against weighbridge & truck scales
- Phase 2: Establish performance baseline with SM-PLM without operator feedback
- Phase 3: Conduct operator training and enable SM-PLM display PLM system for loading
- Quantify truck compliance and operator performance before & after operator adoption



CAT 6020B with ShovelMetrics[™] -Payload monitoring

# Operators	# Trucks	# Bucket s	ShovelMetrics [™] Payload Monitoring error	Truck scale error
3	2	12-16 buckets/tr uck	Average Error = 2.0% STD Dev = 1.4% 4.5% max.	Average Error = 5.5% STD Dev = 14.1% 66% max.



Transcale Weighbridge

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Bucket Fill Analysis

Evaluated by Onboard Truck Scale Reporting

Haul Truck Distribution Density Comparison (419 trucks)



10 - 10 - 20 CAT rule

while larget 245 tonnes				
	ShovelMetrics [™] Payload monitoring	VIMS		
Mean	97.6%	93.6%		
Std. Dv.	11.5%	12.9%		

OEM target: 231 tonnes					
	ShovelMetrics [™] Payload monitoring	VIMS			
Mean	102.7%	98.4%			
Std. Dv.	12.2%	13.6%			

Source: SMg3 PLM & Dispatch

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Density Function



Av. truck fill improved by 6.1%* with ShovelMetrics[™] Payload Monitoring



Haultruck Loading Time Analysis

Evaluated by Truck Dispatch Reporting

Haul Truck Loading Time Comparison (419 trucks)



LoadingTime_SMg3_PLM_wPLMPayload LoadingTime_VIMS_Payload

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Av. loading time improved by 3.7% with ShovelMetrics[™] Payload Monitoring



Specific Energy and Emission Analysis

Evaluated by Truck Dispatch Reporting

SMg3 PLM - Haul Truck Specific Energy Distribution



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Av. Specific energy reduced by 2% with ShovelMetrics[™] Payload Monitoring



Study Results Summarized

Partner Mine Case Study – with ShovelMetrics[™] Payload Monitoring







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