TATA STEEL MINING
MiningForABetterTomorrow

TATA

TQM & Business Excellence

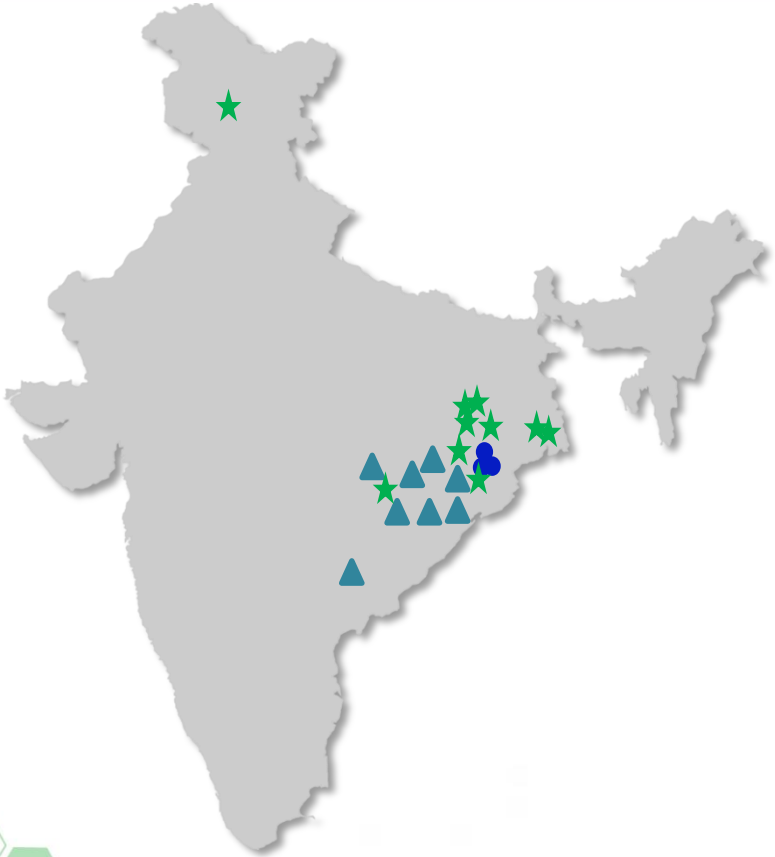
Digital and Sustainable transformation of Logistics in Chrome Ore Mines using Artificial Intelligence

SUKINDA CHROMITE MINES

LAYOUT OF LOGISTIC OPERATION

Sukinda Lease Area
Total Area: 406 HA

16 LAKH TONNE CHROME ORE HANDLED IN FY-23 THROUGH 400+ TRUCKS PER DAY



SUPPLY CHAIN NETWORK

3 Chrome Ore Mines

8 Ferrochrome Plants

- Own (Athagarh, Bamnipal, Gopalpur, Jaipur)
- 4 Processing Partners

Customers

KEY STAKEHOLDERS

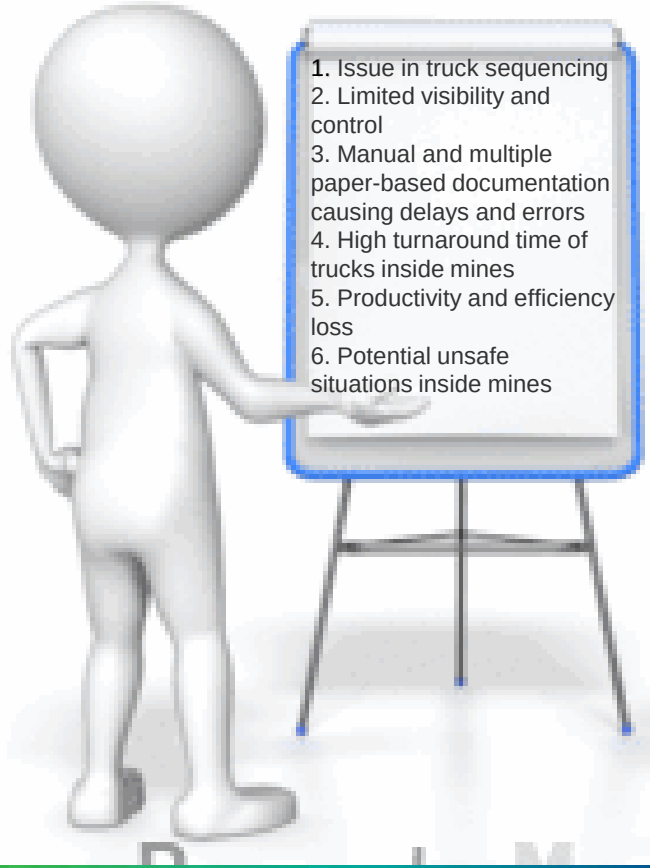
DDM / DDCA – Government of Odisha
Transport Association – 6
Transport Partners – 10
Loading Partner – 1
Number of drivers in the valley – 4500
Number of trucks in the valley – 4000

CONTEXT TO SUKINDA VALLEY LOGISTICS

- Truck entry into the mines is governed by Honourable High Court order on the basis of First-Come-First-Load
- ***Socio-Political*** issues
- Trucks provided by local transport associations to our appointed Transport Partners
- Managing 400+ trucks and drivers ***manually*** every day, ***non-dedicated floating trucks and drivers***
- Multiple IT system like i3MS (a system of Government of Odisha) for Transit Pass, Genesis for Loading Slip, SAP for Invoice, NIC Portal for e-Invoice and e-Waybill
- The entire process of truck entry to exit from mines start in early morning from 5 am onwards and continues upto 9 pm
- Longer stay of drivers inside the mines and inadequate infrastructure of basic amenities leading to unwanted stress

PROBLEM – HIGH TURNAROUND TIME OF TRUCKS AND UNSAFE OPERATION WITHIN MINES

DMADIC



PROBLEM – HIGH TURNAROUND TIME OF TRUCKS AND UNSAFE OPERATION WITHIN MINES

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- Existing duration of logistic activity inside mines: 16 Hrs (5:00 AM to 9: 00 PM)
- Proposed duration of logistic activity inside mines: 12 Hrs (5:00 AM to 5:00 PM)

GOAL: REDUCTION OF 33% OVERTIME TO "ZERO"

***TAT – TURN AROUND TIME**

OBSERVATIONAL ANALYSIS AND TIME STUDY - DISPATCH PROCESS FLOW

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15 mins

Entry Gate

- Manual truck sequencing to adhere FIFO & entry at parking
- Manual checking of documents for cross-verification in M-Parivahan and Vahan
- Manual issue of entry slip / gate pass
- Manual entry of details by operator in log-book

20 mins

Tare Weight

- Driver gets out of truck to hand over the document to weigh bridge operator for tare weight capture
- Manual update of tare weight in i3MS and SAP
- Manual stack selection
- Pre-loading receipt generated on desktop

60 mins

Loading

- Loading takes about 1 hour

45 mins

Verification Bridge

- Weighment of loaded trucks
- Checks for weight limit violations
- Manual adjustment of weighment

60 mins

Gross Weight

- Manual entry of gross weight in SAP & i3MS
- Manual printing of TP
- Gross weight and trip details validated in SAP
- Manual creation / printing of delivery challan
- Manual generation / printing of e-way bill
- Document consolidation and hand over

40 mins

Exit Gate

- Operator hands over printed documents
- Exit truck details recorded manually in log-book
- Transporter supervisor manually generates LR

Red Text depicts inefficient / unsafe practice

ROOT CAUSE ANALYSIS OF INEFFICIENCIES

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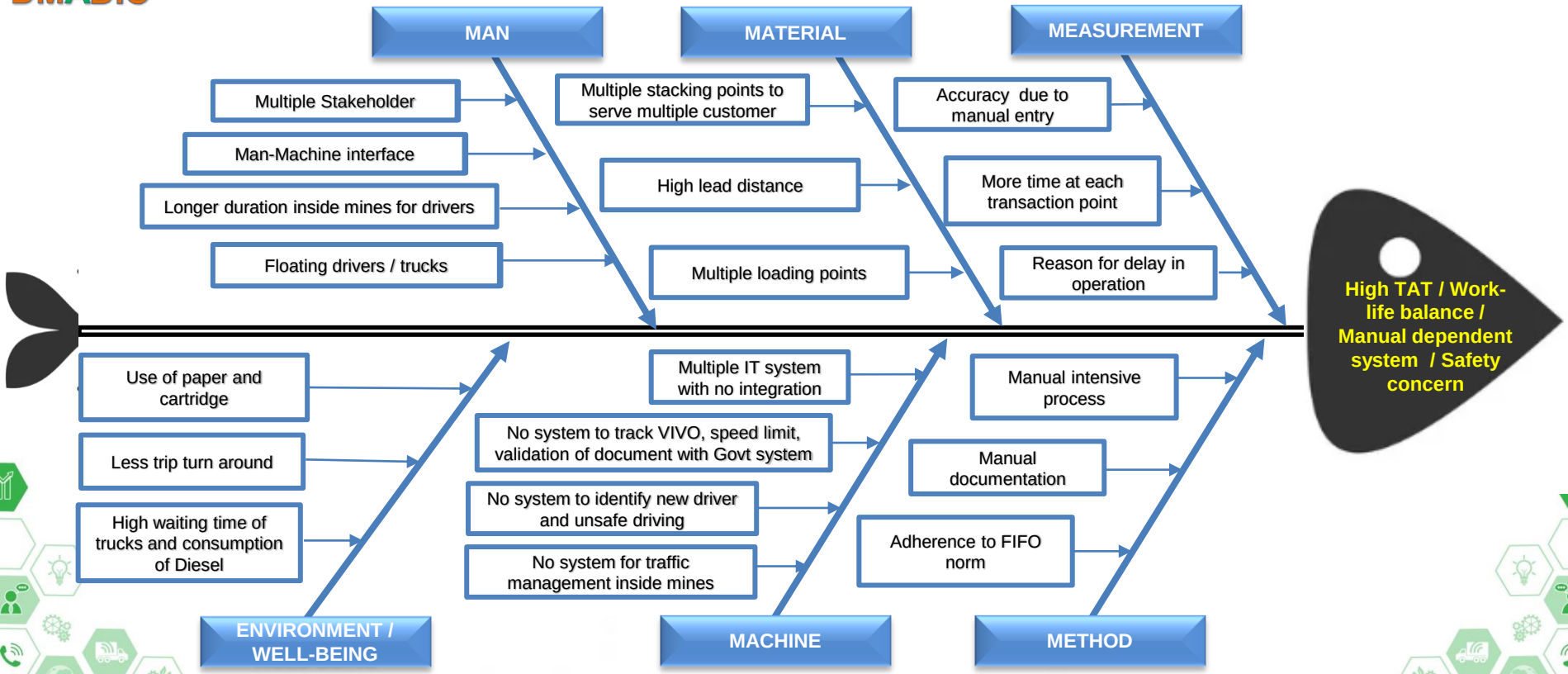

INADEQUATE INFRASTRUCTURE, SYSTEM AND PROCESS IDENTIFIED

E-LOG SYSTEM WITH 8 DESIGN ELEMENTS

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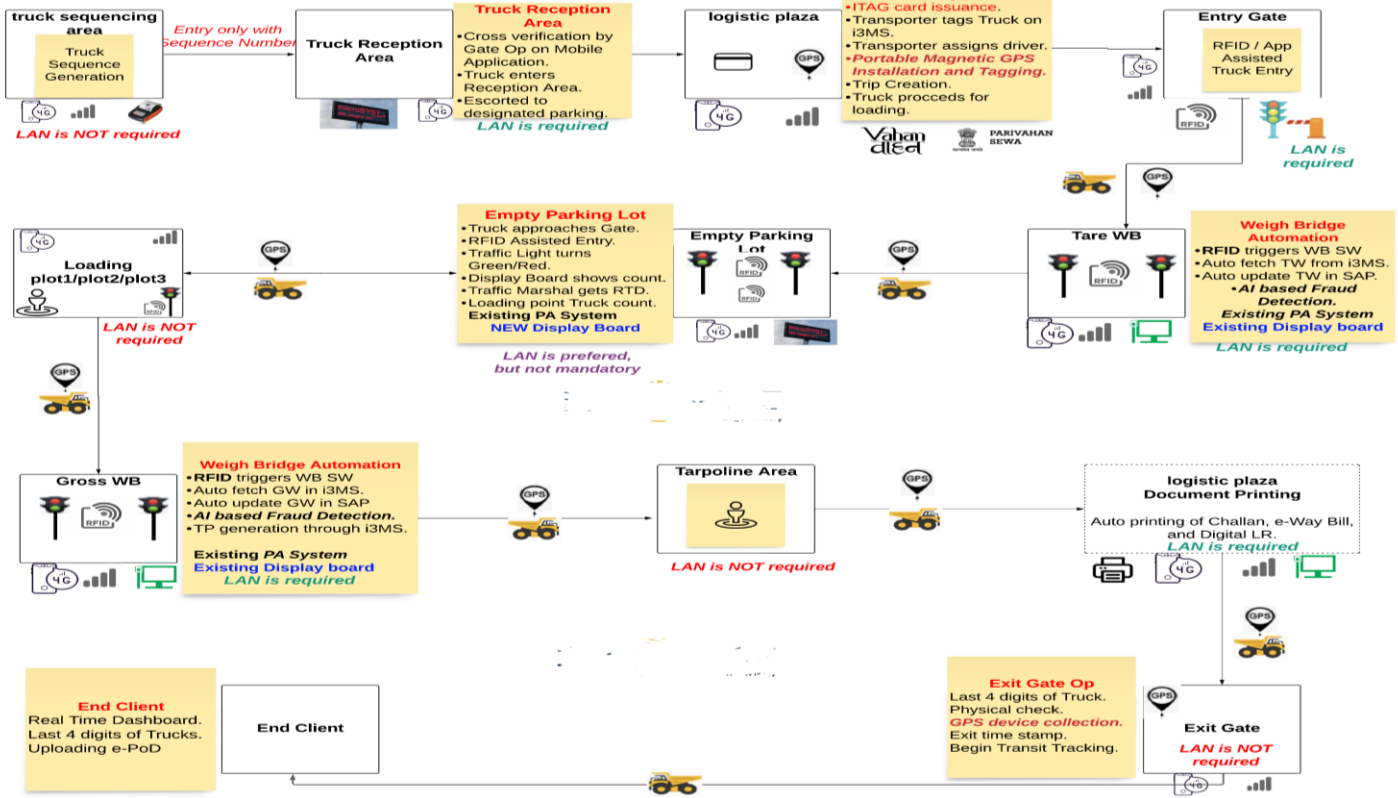
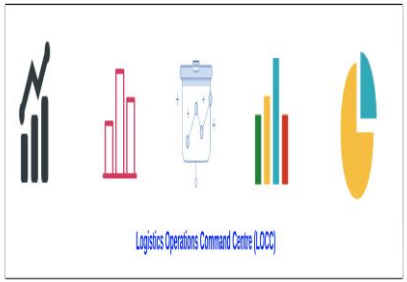
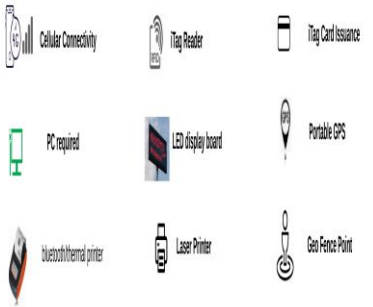
Sl. No.	Factors	Purpose	Design Element
1	Context based customized IT solution	Digitalization	Competent Digital partner selection to leverage on Artificial Intelligence
2	Infrastructure augmentation	Digitalization	IT connectivity inside mines
3	Integration of Multiple IT Systems	Digitalization	Unified platform for SAP, i3MS, GST Portal
4	Safe Traffic Management / Validation of truck and drivers	Safety	Automated boom-barrier, traffic control system
5	Monitoring of trucks	Operational Efficiency	RFID tags / GPS for each truck
6	Detailed Information of trucks and drivers	Digitalization	Digital profile for trucks, drivers and transport partners
7	Safe Working Condition	Safety / Well-being	Amenity centre / training centre for drivers
8	Manual documentation and extensive use of paper and cartridge	Sustainability	Document Cell

INTEGRATED LOGISTICS DIGITAL PLATFORM

DMADIC



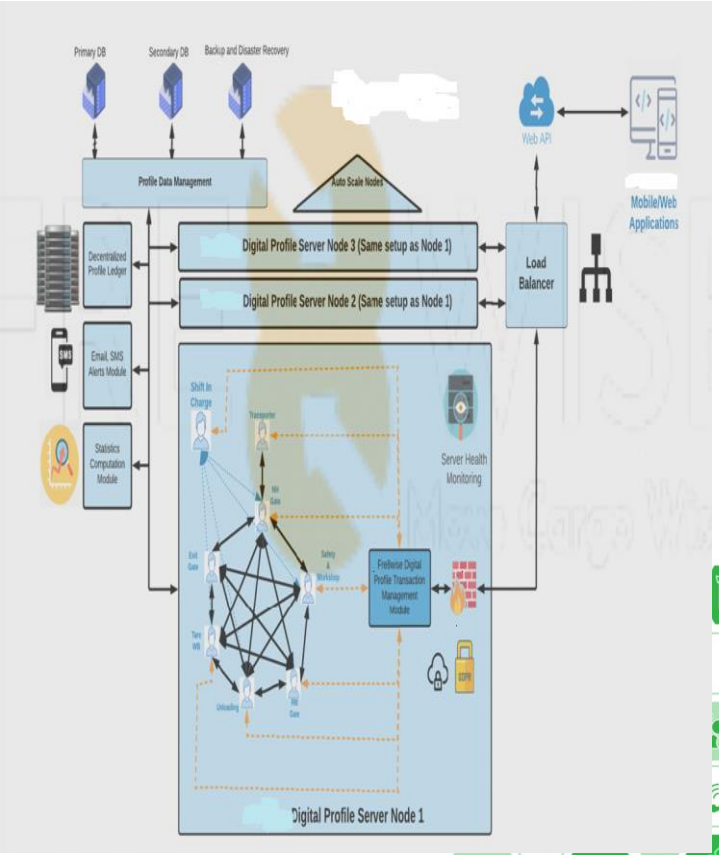




Every transaction made is on a particular trip is stored on a ledger, and is verified against other transactions on the trip. This constitutes eLog's quasi blockchain architecture.

Transaction validity rules are customizable and can be configured according to the business requirements. eLog allows only valid transactions at that point of time to be performed by respective stakeholders, significantly decreasing the number of user errors and data corruption caused due to errors.

AI powered Quasi Blockchain based Digital Solution



IMPLEMENTATION TIME PLAN

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Sl. No.	Milestone Chart	Period												
		Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23
1	Vendor finilisation and Sign off with vendor													
2	Placement order for hardware devices													
3	Start Application Design and Development													
4	Complete ERP Integration, build APIs to Integrate with Hardware & Integration with Hardware devices													
5	Complete Unit Testing of end to end platform & Application Dry run test													
6	Training to Transporters, Users and UAT with users													
7	Get sign-off on platform readiness													
8	Go Live													

PLAN DELAYED ON TIME

NEW DIGITIZED PROCESS – RFID POWERED AI BASED QUASI BLOCKCHAIN

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Reception Gate

- Truck sequencing and issue of token through system.
- Trip creation and auto gate pass
- RFID & GPS issuance
- Truck and driver assignment

Entry Gate

- Truck reaches entry gate
- RFID reader switch traffic light colours, boom gate opens
- Entry gate operator can cross verify

Tare Weight

- RFID reader triggers Weigh Bridge Software
- Auto fetch tare weight
- Auto update tare weight in SAP

Parking Lot

- RFID reader only allows authorized trucks inside
- RFID reader switch traffic light
- Trucks await intelligent loading through display board

Shift-in-charge

- Real-time dashboard
- Update DO in app
- i3MS permit info in app
- Behavioral based truck blocking
- Generate hourly reports in app

TAT = 4+ hours

TAT = 2 hours

Exit Gate

- Last 4 digits of truck recorded
- Handover printed documents
- Exit time stamp
- GPS device collection

Gross Weight & Documentation

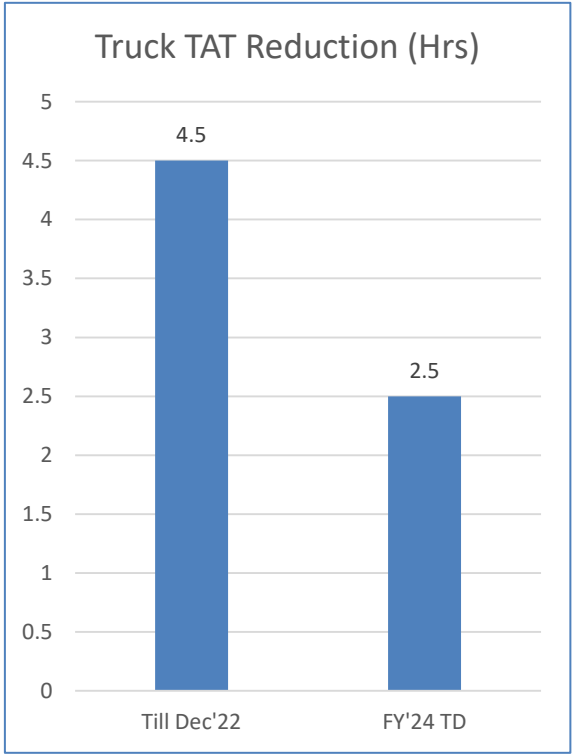
- RFID reader triggers Weigh Bridge Software
- Auto fetch gross weight TP generation in i3MS
- Auto invoice in SAP
- Auto E-Way Bill generation
- Auto digital LR generation
- Auto printing done through SAP

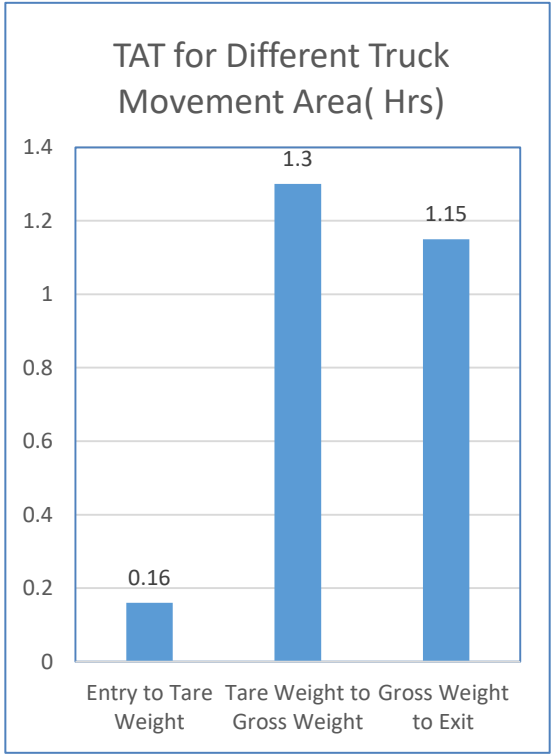
Loading

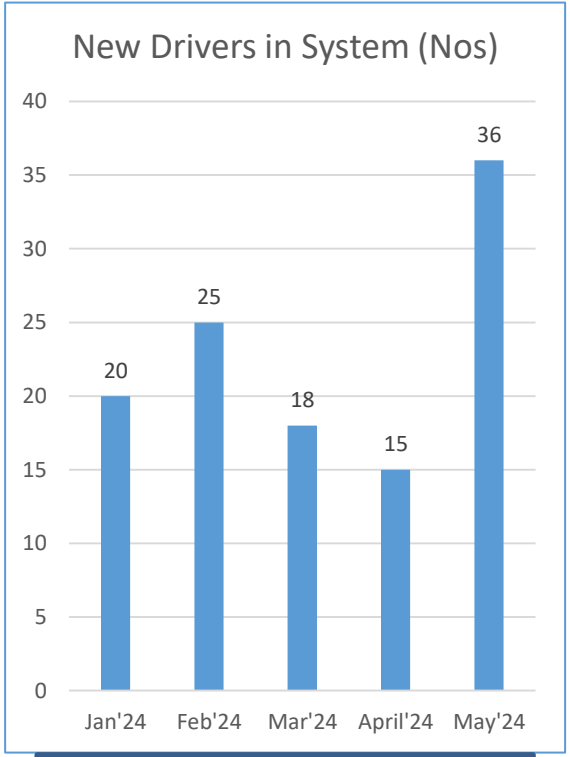
- Loading is done, manually or mechanically

KPI'S BEING MONITORED

DMADIC







New drivers need to be trained for familiarization with mine's hazard

KPI'S BEING MONITORED

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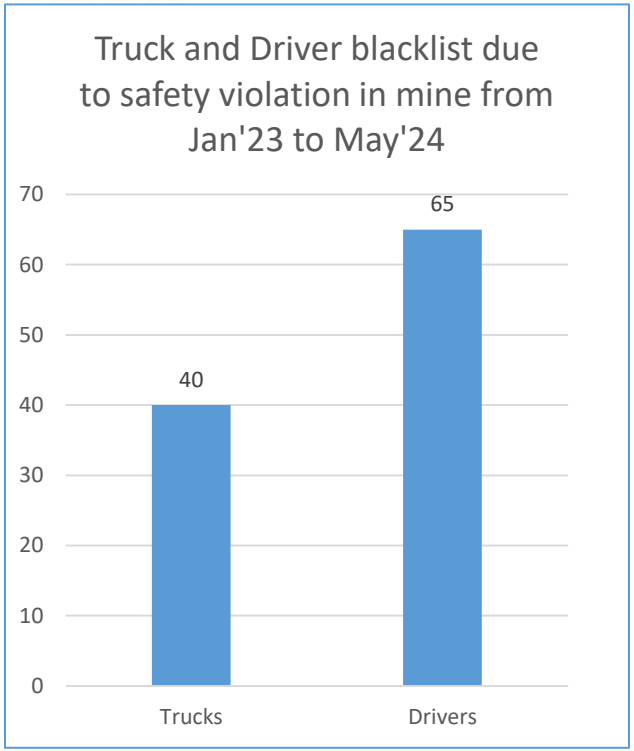

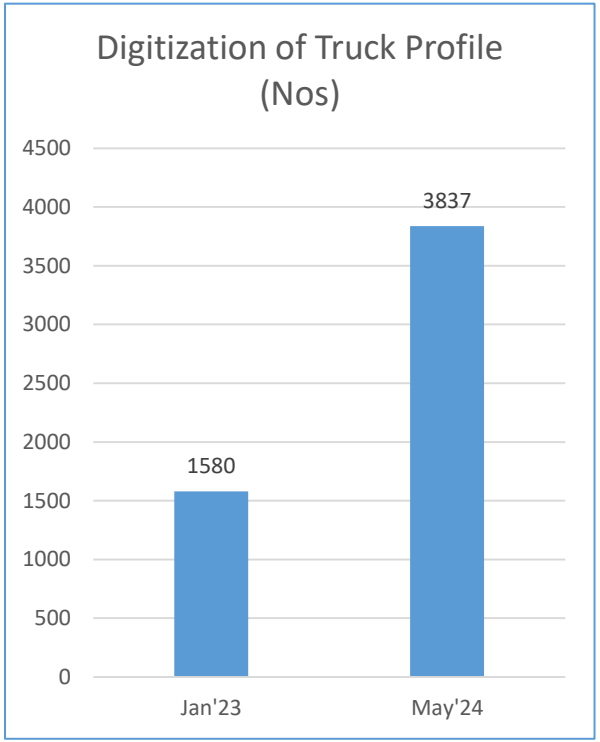

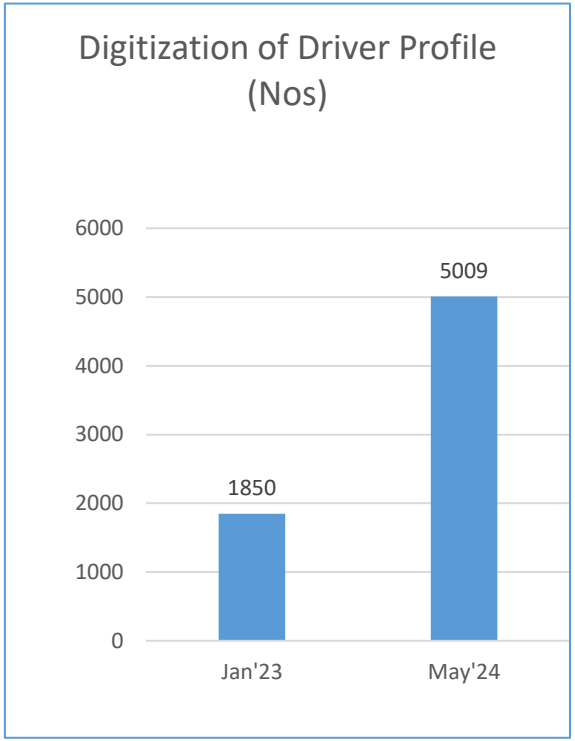

CONTROL AND MONITORING OF TRUCKS / DRIVERS

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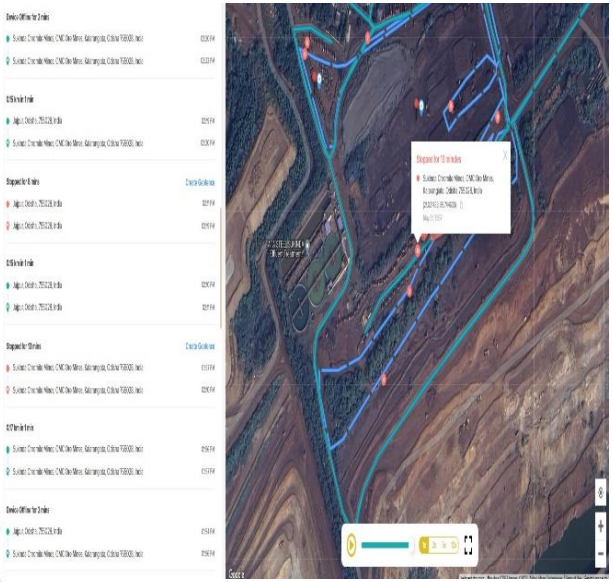
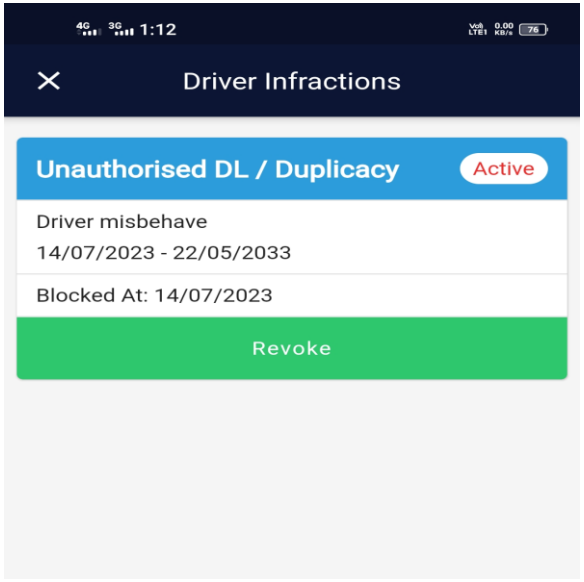
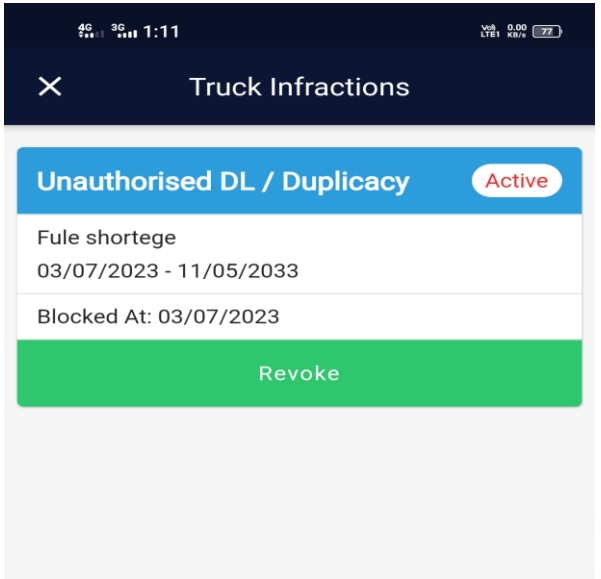


Tracking of trucks inside mine



Mapping of drivers for un-safe activity



Mapping of trucks for not adhering to safety checklist

CLEAR VISIBILITY & REAL-TIME MONITORING THROUGH MOBILE APP

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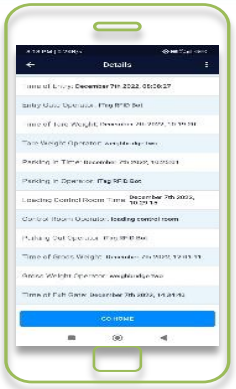
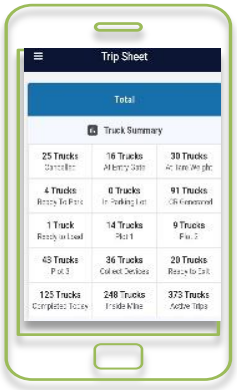
Manage Sales Orders

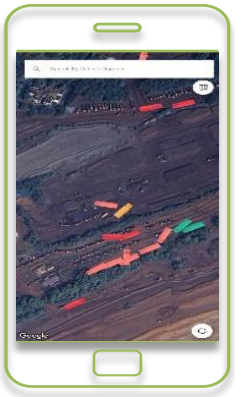
Instant Trip / Driver Details



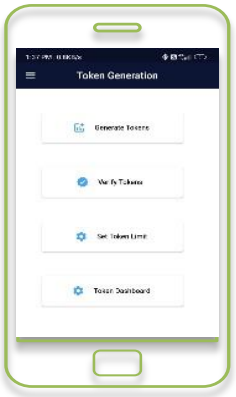
Monitoring TAT



Summary Sheet



Telematics



Truck Sequencing

TRUCK VALIDATION AND TRAFFIC MANAGEMENT

DMADIC

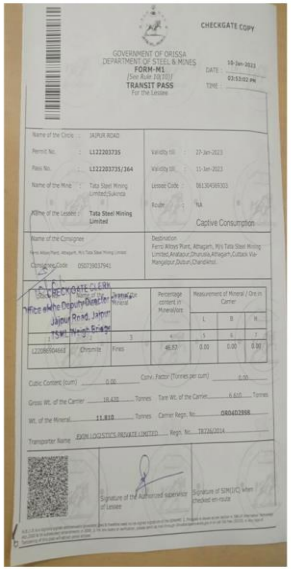
Automation for valid truck entry with the help of Reader and Boom Barrier

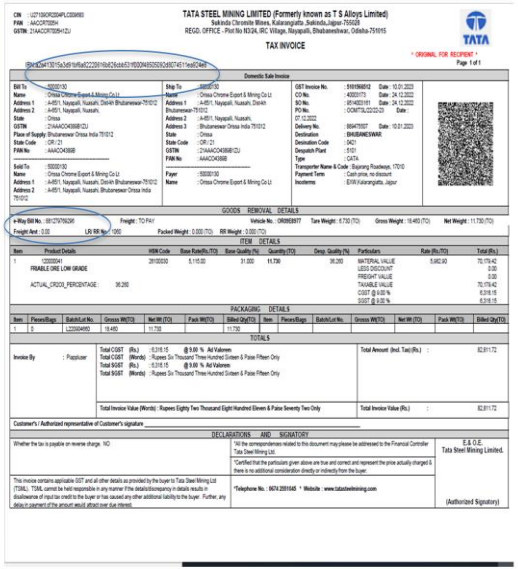
i-Tag on Trucks

Traffic Lights

BEFORE VS AFTER

Sr. No.	Subject	Before	After	Result
1	Manual Intervention (excluding loading area)	9 instances per truck	2 instances per truck	Improvement in Safety - Reduction in Man-Machine interface
2	Usage of Paper (A4 sheet per truck)	8	3	Saving of almost 50,000 papers a month -> reduction in Carbon Footprint
3	Turn-Around - Time inside mines	4-5 Hours	2 Hours	Faster completion of daily job
4	Mental Stress	High waiting time	Less waiting time	Improved Work-Life balance
5	Process and Systems	Complex, no visibility	Simple & complete visualisation	Digitization





- Saving of Rs 3.23 L towards Paper and Cartridge Cost
- Saving of 1002 Kg of CO2 equivalent between Jan – Aug 23

AUTO DOCUMENT GENERATION/PRINTING WITH E-PASS SCAN

STEP TOWARDS WELLBEING OF UNSUNG HEROES (DRIVERS) OF OUR LOGISTIC ECO-SYSTEM

Amenity Centre for Drivers

Training Centre for Drivers

Tarpaulin covering facility for loaded trucks

Rest Shelter for Drivers

Monthly Health Camp for Drivers

Canteen facility for Drivers

WAY FORWARD // JOURNEY CONTINUES…..

SHE

SAFETY

HEALTH

ENVIRONMENT

ADVANCED DRIVER ASSISTANCE SYSTEM (ADAS) – Alerts for forward collisions, speed violations etc

RFID WEARABLES – track and monitor location density for all drivers / employees

DRIVER COACHING – Improve driver behavior, reward good drivers; increase overall standard

DRIVER HEALTH MODULE – health database management

DRIVER MANAGEMENT SYSTEM (DMS) – Face ID check; drowsy & distracted driving alerts

COMPLETE AUTOMATION – move toward a 100% digitalized and automated setup

SUSTAINABILITY – Paper Less transaction

IMPROVED MENTAL WELLBEING

CARBON NEUTRAL FUTURE

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THANK YOU