



Partnering with Quarries Through Technology

NZQuarry 2026 - Invercargill

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The Connected Quarry





MACHINE TECHNOLOGY

Safety
Emissions
Automation



COMMS

Machine Health
Productivity



UTILISING DRONES

Surveys
Stockpiles
Designs



FLEET MANAGEMENT SOLUTIONS

Safety
Defect Control
Productivity



SERVICING

Upskilling
Fleet Uptime
Life Cycle Costs



AI

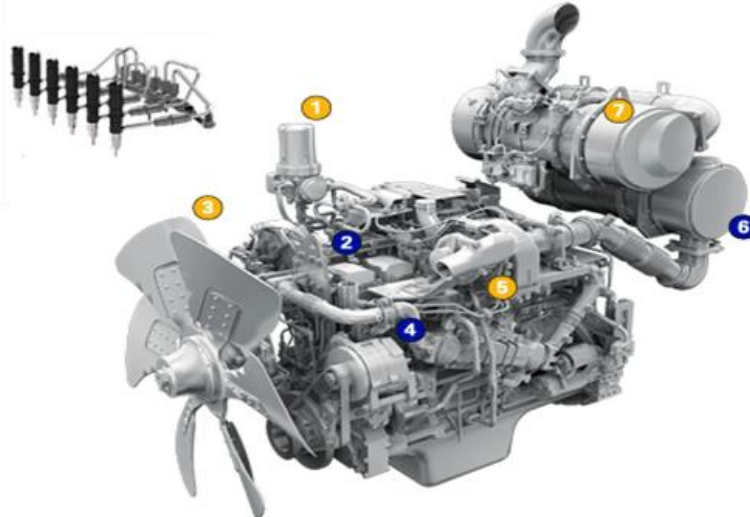
Efficiency

Controlling Emissions – Tier 4 & Euro Stage 5



1. Closed Crankcase Ventilation

2. Combustion System Optimisation

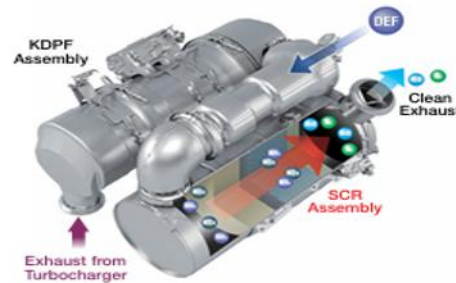


3. Engine Control Unit



4. Exhaust Gas Recirculation (EGR)

- a) EGR Valve
- b) EGR Cooler



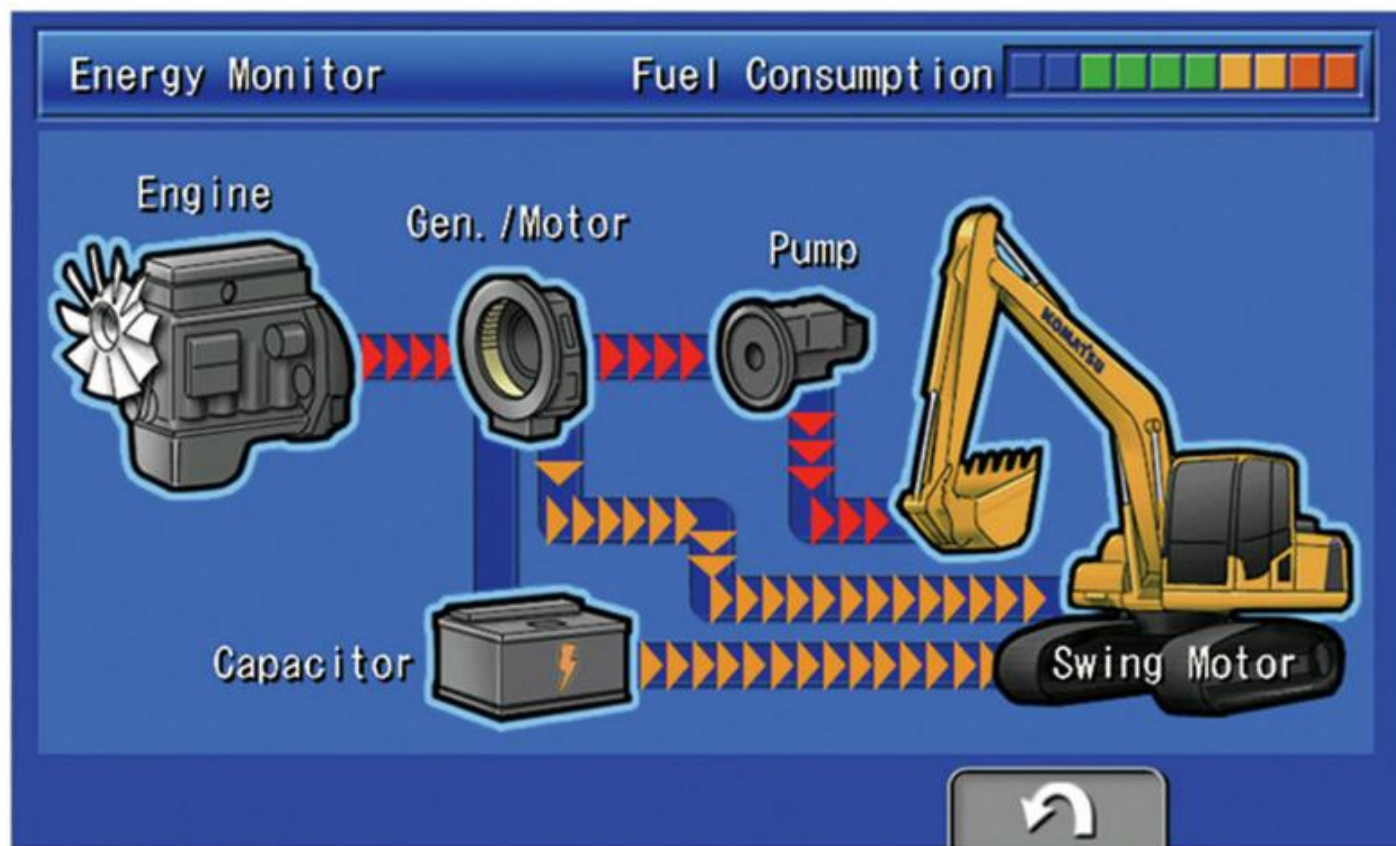
5. Variable Geometry Turbo



6. Diesel Particulate Filter (DPF)



7. Selective Catalytic Reduction (SCR)



About the hybrid electrical system

The generator motor is positioned between the engine and hydraulic generator is used in place of the hydraulic swing motor and the inverter and store electrical charge.

Electric swing motor generator

The electric swing motor generator uses electrical power from the inverter to drive the upperstructure during the swing function. During the deceleration, the electric swing motor generator converts kinetic energy back into electrical energy and stores it in the capacitor via the inverter.

Electric generator motor

The generator motor generates electric power with engine torque to the capacitor when necessary.

The engine assist function of the generator motor gives the Komatsu excavator the ability to provide power on demand utilising only the engine RPM required for idle speed of 700 rpm and downsizing of the engine from a six cylinder to a four cylinder, improving performance, power or productivity.

Ultra capacitor with inverter

The inverter rapidly converts electricity from either the electric swing motor from AC to DC for storage in the ultra capacitor and from DC to AC to the motor for engine assist as required.

Electrification

✓ Positives

- Lower Operating Costs
- Reduced Emissions
- Lower Noise Levels
- Improved Efficiency

⚠ Negatives

- High Upfront Cost
- Charging Infrastructure Required
- Limited Run Time / Range
- Charging Downtime
- Technology Still Developing



Hydrogen and Future Cells

- Hydrogen = key pathway to decarbonise heavy equipment
- Focus on mining trucks first (high energy needs)
- Partnering with GM (fuel cells) and Toyota (excavators)
- Developing:
 - Fuel cell haul trucks (zero emissions)
 - Hydrogen excavators (concept stage)
 - Hydrogen combustion trucks (lower-cost option)
- Why hydrogen:
 - Higher energy density than batteries
 - Faster refueling
 - Better for large machines
- Challenges:
 - Refueling infrastructure
 - Safety + cost
 - Still in testing phase



Autonomy

Improved safety

- Removes operators from high-risk areas
- Zero system-related injuries reported

Higher productivity

- 24/7 operation (no breaks or shift change delays)
- More consistent haul cycles

Lower operating costs

- Reduced labour requirements
- Lower maintenance and wear

Better equipment life

- Up to 40% longer tyre and brake life

Greater efficiency

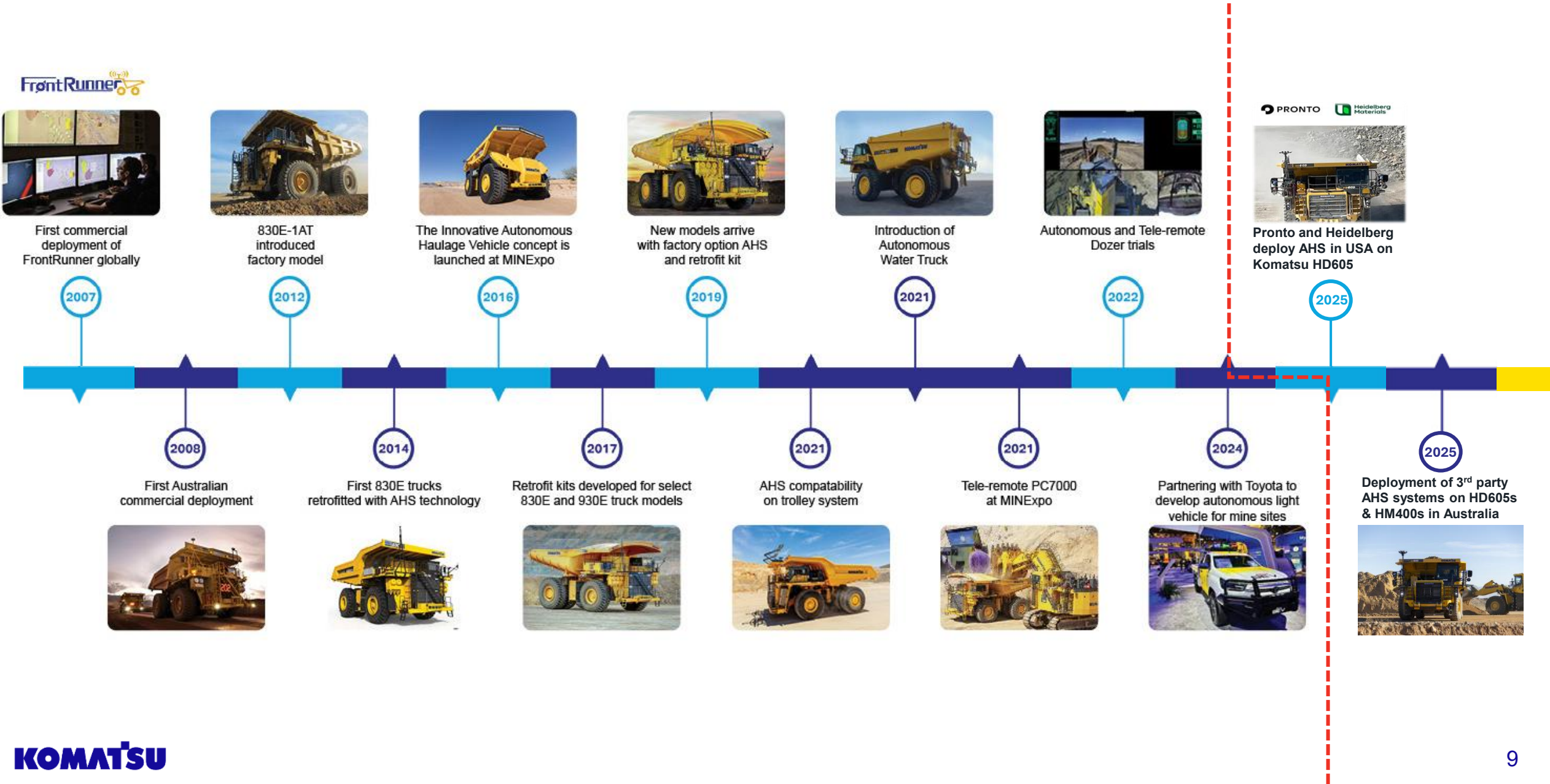
- Optimised routing, speed, and fleet coordination
- Less idle time and fuel use

Consistent performance

- Predictable, stable output aligned to mine plans



Development of Autonomy

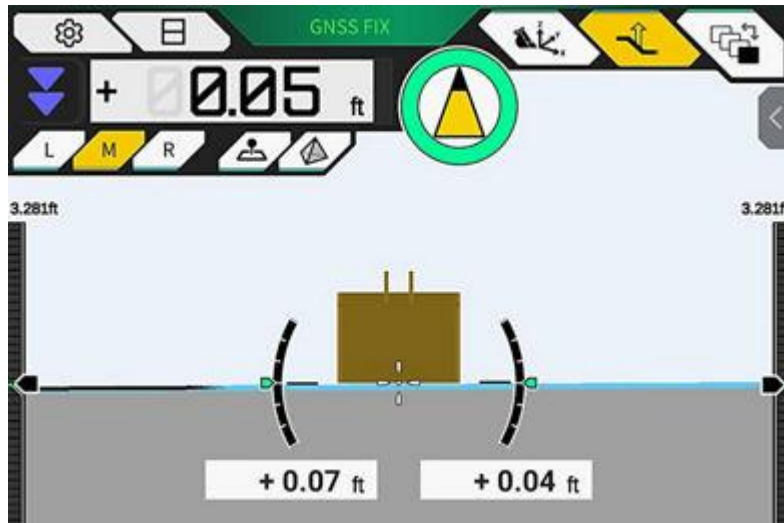


3D Machine Guidance & Control Systems

3D-MG guides the operator; iMC controls the machine

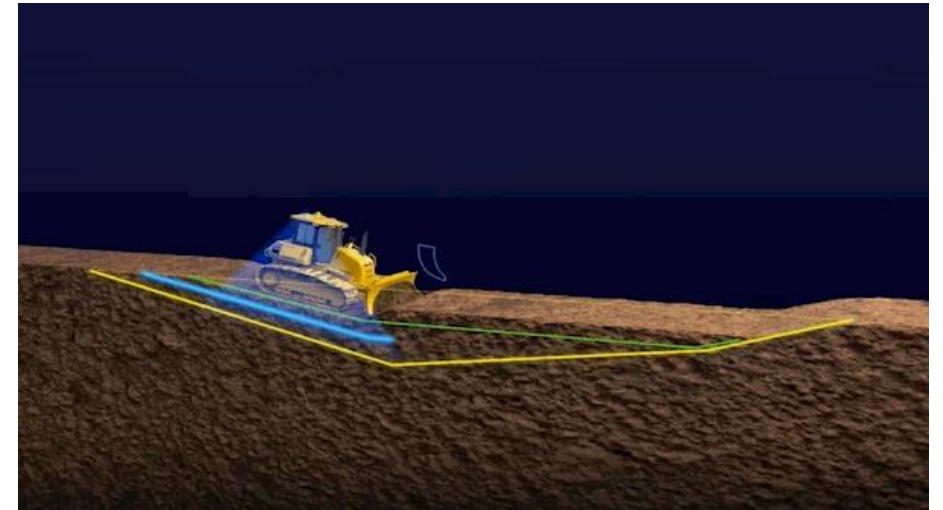
3D Machine Guidance (3D-MG)

- Guidance-only system – operator manually controls machine
- Provides real-time cut/fill data via screen display
- Requires high operator skill to follow design accurately
- Works on retrofit machines (any brand)
- Lower upfront cost
- Suitable for less complex or lower precision work

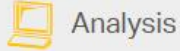


Intelligent Machine Control (iMC)

- Semi-automated machine control – system assists blade/bucket movement
- Automatically adjusts to design surface (limits over-cutting)
- Reduces need for staking and rework
- Requires less operator experience to achieve accuracy
- Higher upfront cost but improves productivity & consistency



Fleet Management Systems (FMS)



Analysis



Efficiency



Lower Operating Costs



Safety

Control and lower operating costs

Identify operational inefficiencies, plan your maintenance and maximize machine uptime

Streamlined efficiency

Boost productivity, streamline operations and lower emissions by monitoring all aspects of site's production process in one place. Real-time dashboards provide an up-to-date overview of what is happening when and where

On-site safety

Thanks to real-time operator feedback, such as overload and overspeed alerts, with back-office reporting functions, on-site safety can be constantly monitored and improved. The pre-start checklist will ensure any defects are discovered and dealt with in a structured way, resulting in maximized on-site safety.

Smart Quarry Site



Drone Flights

Accurate Stockpile Measurement

- Fast, highly accurate volume calculations
- Improves inventory tracking and reporting

Time & Cost Efficiency

- Survey large areas in minutes vs hours/days
- Reduces need for manual survey crews

Improved Safety

- Eliminates need for personnel on unstable or high-risk areas
- Minimises exposure to heavy machinery zones

High-Resolution Data

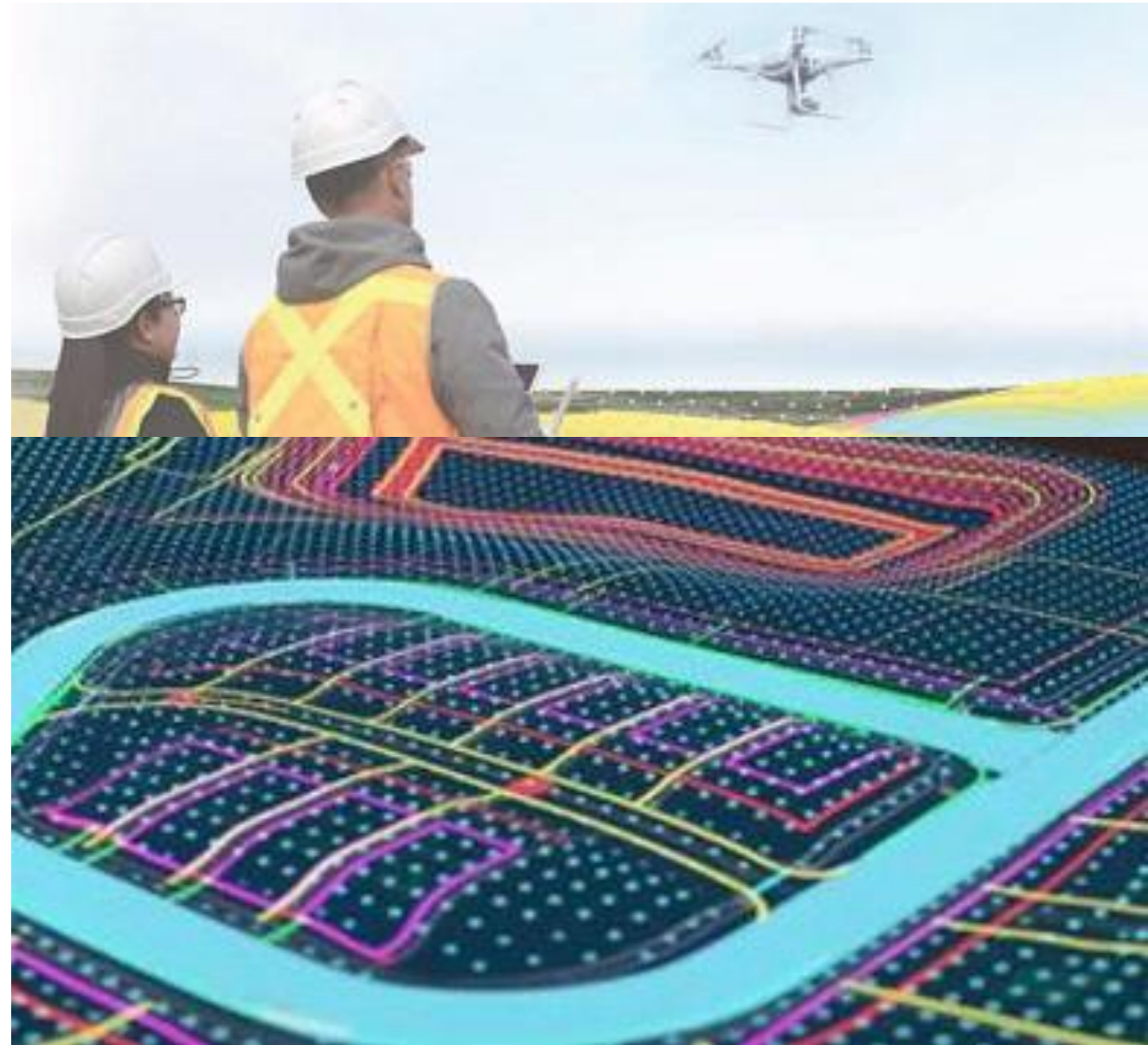
- Generates detailed 3D models, contours, and maps
- Supports planning, design, and site optimisation

Frequent Monitoring

- Enables regular surveys (weekly/daily if needed) Tracks production, haul roads, and pit progression

Integration with Machine Control

- Data feeds into 3D-MG and iMC systems
- Improves accuracy of earthworks and grading



Machine ICT

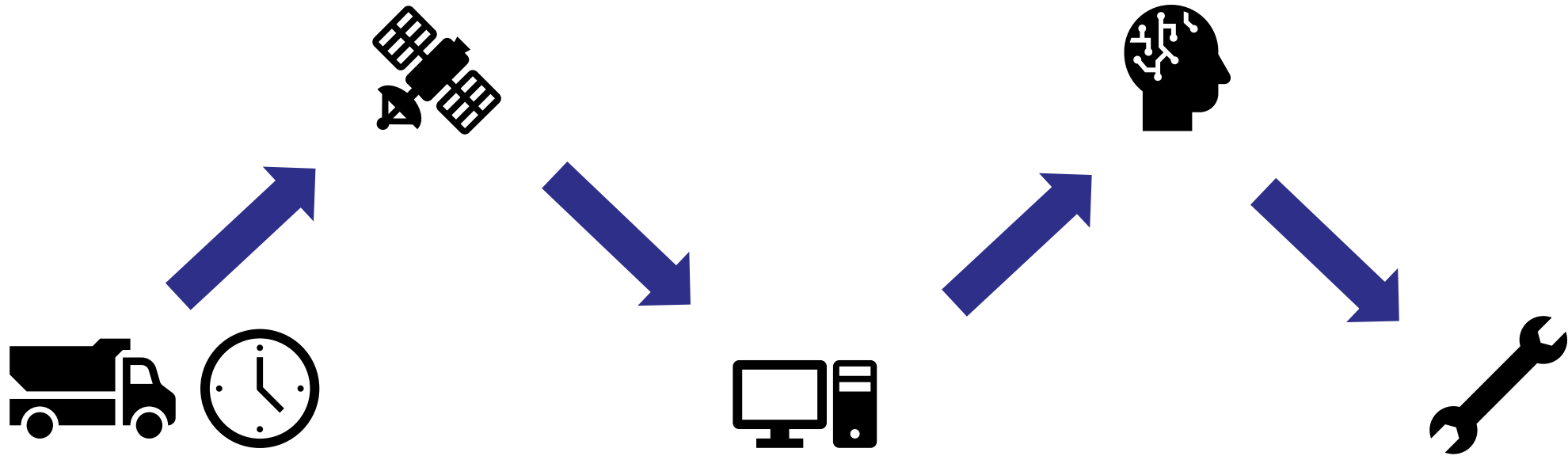
Satellite ICT Systems (Komtrax)

- **Real-time Machine Tracking**
 - GPS-based location monitoring of equipment across sites
- **Remote Machine Monitoring**
 - Tracks hours, fuel usage, idle time, and utilisation
- **Preventive Maintenance Alerts**
 - Automated service reminders reduce downtime and repair costs
- **Operational Insights**
 - Identifies inefficiencies (idle time, overuse, underutilisation) Supports data-driven decision making
- **Theft Prevention & Security**
 - Geofencing alerts and machine movement tracking
- **Fleet Management Integration**
 - Centralised platform to monitor multiple machines and sites
- **Productivity Improvement**
 - Optimises machine performance and job site efficiency



Maintenance Planning

By utilising ICT systems, we can forecast machine utilisation and schedule Preventative Maintenance tasks accordingly



Tech GPT

Using Open AI to reference proprietary Source Materials to reduce troubleshooting steps

Using real time telemetry to assists with multiple & complex faults that may have a different outcome than a standalone occurrence

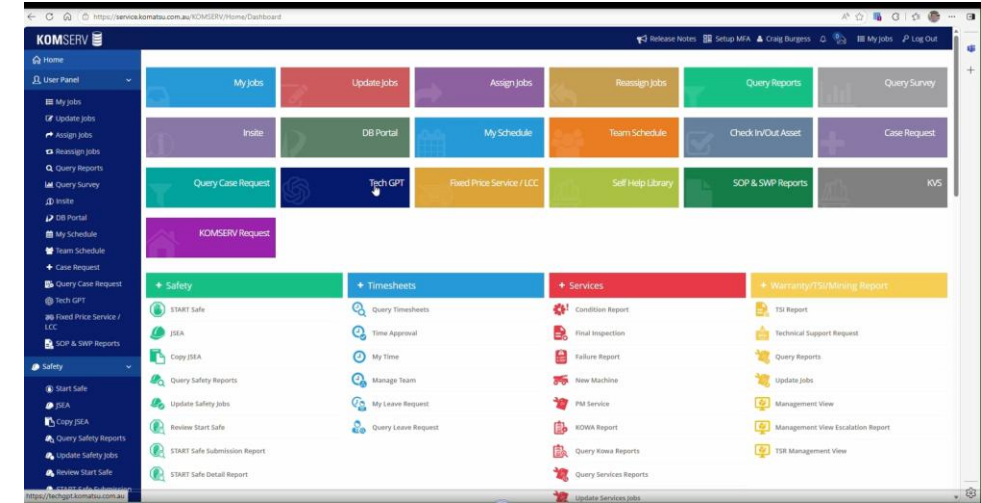
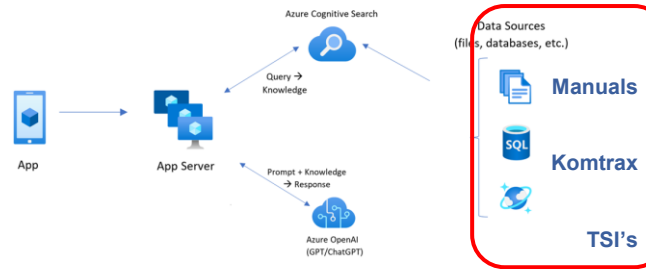
Global data base Komatsu specific
IP from distributors & factories

TECHGPT

Technician can search possible causes by:

- Machine model
- Complaint
- Fault Codes
- Cause
- Service News
- Key words

Tech GPT system architecture



Data
Output

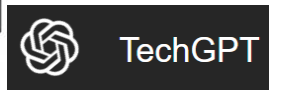
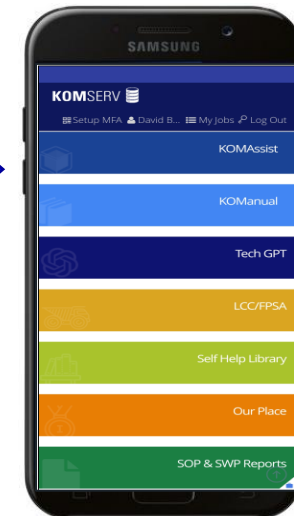
****Machine**** PC200LC-11

****Machine**** WA500-7

DATA
Warehouse

****Machine****
****Complaint**** Machine arm is jerking when used for fine control
****Cause**** Arm spool moving too fast to perform accurate fine control work
****Correction**** Insert hydraulic components listed in Service News AR15020
P/N 723-56-14405

TECHGPT Pulls
information from
Data Warehouse



Closing



Final Thought

