



**ARAV Inc.**

**Introduction Material**

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# Track Record



Founded in April 2020 and now in its sixth year, ARAV Inc. continues to grow with accelerating momentum.

We have a proven track record of transactions with customers in diverse industries, including construction machinery manufacturers, major general contractors, manufacturing, steel, mining, and industrial plants.

# Industries and Applications

Ensuring safety at diverse and harsh job sites.

Contributing to the reduction of business continuity risks and the enhancement of productivity.



Steel

A close-up view of a worker in a dark environment, possibly a steel mill, handling a large piece of metal. The worker is wearing a hard hat and safety gear. The scene is dimly lit, with some light reflecting off the metal surfaces.



Mining

A large yellow mining truck is shown in a dusty, open-pit mine environment. The truck is parked on a dirt road, and the background shows the rugged terrain of the mine.



Industrial Plants

A view of a large industrial facility with various pipes, tanks, and structures. The scene is dimly lit, with some lights visible in the background.



Civil Engineering  
(Tunnels, Roads,  
Riverbed Excavation)

A view of a large-scale construction project, possibly a tunnel or road excavation. The scene shows heavy machinery and structural elements in a dimly lit environment.



Marine Civil  
Engineering(Dredging)

A view of a large-scale marine construction project, possibly a dredging operation. The scene shows heavy machinery and structural elements in a dimly lit environment.



Architecture

A view of a large-scale construction project, possibly a building or infrastructure. The scene shows heavy machinery and structural elements in a dimly lit environment.



Asphalt Plants

A view of an asphalt plant facility with large storage piles and processing equipment. The scene is dimly lit, with some lights visible in the background.



Recycling & Industrial  
Waste

A view of a recycling or industrial waste facility. The scene shows heavy machinery and large piles of waste material in a dimly lit environment.



Logistics

A view of a logistics facility, possibly a warehouse or distribution center. The scene shows heavy machinery and large stacks of materials in a dimly lit environment.



**Keeping people away from danger, freeing sites from the constraints of time and place, and increasing productivity. Realizing a new vision for construction sites through the automation and remote control of construction machinery.**

In various key industries that support the arteries of society, such as steel mills, mines, civil engineering works, plants/factories, and power plants, the sites are constantly exposed to harsh environments. High temperature and humidity, dust, extreme heat and cold, or the danger of collapse. Until now, skilled workers have supported these sites with their expertise, often disregarding their own risks.

However, the industrial world is now facing a structural crisis. Serious labor shortages due to the declining birthrate and aging population, the retirement of skilled technicians, the need to comply with safety regulations, and the efficiency of operations. Operating sites solely reliant on traditional "human power" is reaching its limit. ARAV's proposed automation and remote control solutions for construction machinery are the answer to these challenges and a new platform for pioneering the future of the industry.

We will promote DX in all areas, transforming the current state of manned operations into remote and autonomous operations.

# About ARAV's Core Technology and Solutions

# ARAV's Core Technology - Retrofit/Multi-Manufacturer Support

## A system compatible with any construction machine

DX transformation of existing construction machines through retrofit. Automated driving and remote control functions can be added to existing construction machinery as a retrofit, compatible with all manufacturers and models.

### Key Features

- Retrofit possible on existing construction machines (MODEL V / E compatible)
- Also supports hydraulic control construction machines (MODEL V)
- Electronic control intervention eliminates the need for mechanical components (MODEL E)
- Can be installed regardless of the construction machine manufacturer



#### **MODEL V** (Compatible with hydraulic control construction machines)

Intervenes in the hydraulic control lever, enabling remote control and automated driving as a retrofit, even for older machines. Also compatible with mechanical operating levers.



#### **MODEL E** (Compatible with electronically controlled construction machines)

Intervenes in electronic controls such as the CAN bus, allowing smart deployment without the need for mechanical components. The optimal solution for the latest construction machines.

# ARAV's Core Technology - Hardware Control

## Machine Gateway

We develop machine gateways tailored to each machine. It bridges the machine's control system and the upper-level system, ensuring reliable control.



## Extensive Track Record

We have development experience corresponding to the operating parts of various machines, including hydraulic excavators, wheel loaders, bulldozers, forklifts, and cranes.



# ARAV's Core Technology - Software Control

## Proprietary Protocol

ARAV's proprietary communication protocol achieves both a significant reduction in communication delay and advanced security measures. Remote operation is possible domestically and internationally as long as there is an internet connection.

## Operation Control Technology

We possess a variety of technologies for controlling the operation of construction machinery, from intervention in hydraulic control levers to electronic control.

## Low Latency Performance (Reference Value)

	Connection distance	Video Latency	Command Latency
Ver. Long Range	1,141km	338ms	115ms
Ver. Short Range	100km	261ms	87ms

## Operable from anywhere with an internet connection

Remote operation is possible domestically and internationally with an internet connection such as Wi-Fi, 4G/5G, or wired LAN.

# Solution Features - Automation/Remote Control Capability

Keeping people away from danger, freeing sites from the constraints of time and place, and increasing productivity.



## Labor Saving

Solving labor shortage challenges through automation.



## Efficiency

Improving productivity by enabling night and early-morning operations.



## Safety

Eliminating industrial accident risks through unmanned operations in hazardous areas.

## Automated Driving Technology

Achieving automation and DX transformation of construction machines as a retrofit. Realizing tasks impossible for humans, from replacing dangerous work to operating in the late night and early morning.

## Remote Control Technology

Enabling remote operation as a retrofit for legacy construction machines, as well as electronically controlled ones.

# Solution Features - Consulting and Partnership that considers the entire process

## Consulting and Scalability considering the entire process

We propose optimization of the entire process suited to each site, not just single automation or remote control.



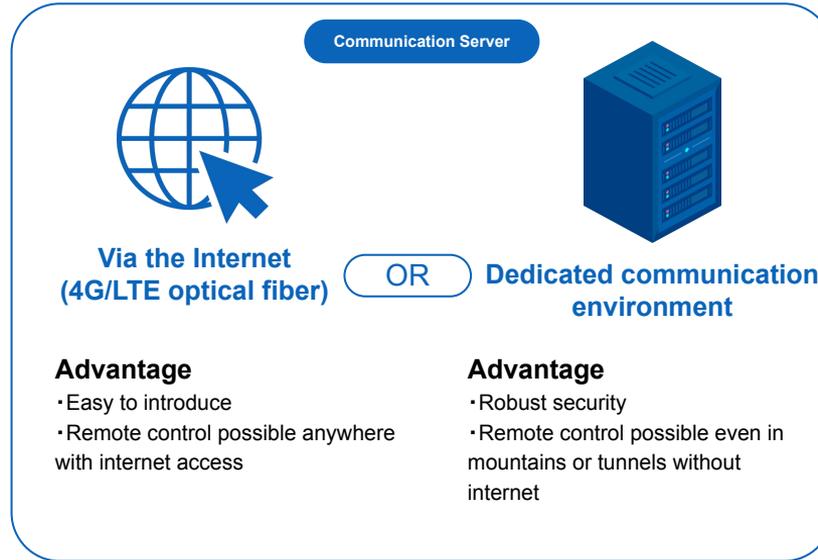
## In-house Development of both Hardware and Software: Integrated Management and Partnership

We develop both hardware and software in-house and manage maintenance and care consistently. We continue to partner with you even after implementation.



# Regarding the communication environment

Automation and remote control of heavy machinery are possible using internet lines such as 4G, LTE, or a proprietary communication environment.



## Tokyo-Saga

Distance approx. 1141 km

Latency approx. 0.3 seconds

Heavy Machinery: Hydraulic Excavator



# Effects of Introducing the ARAV Solution

## Suppress Long Working Hours

Fully compatible with the "Work Style Reform Act"

By introducing remote control, one person can operate multiple construction machines with different daily operating hours at a construction site, thereby improving site productivity. Furthermore, remote operation eliminates the need to travel to the location of the construction machine each time for commuting or returning after breaks, making it possible to significantly reduce working hours.

## A Conducive Working Environment

Reduction of turnover rate and securing human resources

The use of remotely controlled construction machinery improves productivity in dangerous operations such as secondary disasters during landslide recovery work, demolition work, tunnel blasting, and prolonged work in scorching heat. Additionally, remote operation allows for the conversion of dangerous tasks—such as the risk of heatstroke during long hours of work in hot weather and radiation exposure during construction machine-assisted decommissioning work—to safe tasks, contributing to the improvement of the turnover rate and the resolution of labor shortages.

# Example of Expected Introduction

# Example of Expected Introduction at a Steel Mill Site

## Phase 1



### Small Start - Proving value with just one machine

First, we start with one construction machine that presents a major challenge at the site. We select the optimal machine, such as a hydraulic excavator, wheel loader, or ripping dozer, after consultation. We address particularly dangerous tasks or tasks with a high burden on the operator, such as slag removal/transport and loading in dusty raw material yards. Based on the results obtained from handling one machine, the image of future possibilities/development, and the potential for safety improvement, we propose further site DX promotion. We also consider mechanisms and solutions that will take root in the site's operation.

## Phase 2



### Horizontal Expansion - Expanding to multiple machines, proposal for automation introduction

After confirming the practicality with one construction machine, we propose remote control or automation of the second and subsequent construction machines for specific work areas or specific sites. Remote control/automation of multiple machines involved in slag work, scrap transportation, and excavation leads to securing safety at the steel mill site, reducing travel time to the site, improving the operator's working environment, and increasing work efficiency.

## Phase 3



### Final Phase

The ultimate concept is to further increase the number of remotely and automatically operable construction machines at the site, aiming to create a situation of unmanned operation, unconstrained by time or place. We believe this will contribute to resolving labor shortages, pursuing safety, and further improving productivity at the steel mill site. We aim for site DX that cannot be achieved with the remote control/automation of just one construction machine.

# Example of Expected Introduction at a Mine Site

## Phase 1



### Small Start - Proving value with just one machine

First, we start with one construction machine that presents a major challenge at the site. We select the optimal machine, such as a hydraulic excavator, breaker, heavy dump truck, or wheel loader, after consultation. Based on the practicality, future potential, safety improvement, and development image obtained there, we propose further DX promotion.

## Phase 2



### Proposal for Automation Introduction

After confirming the practicality with one construction machine, we propose remote control or automation of the second and subsequent construction machines for specific work areas or sites. Remote control/automation of multiple machines involved in excavation, loading, raw material yard transportation, and crushing leads to securing safety at the mine site, reducing travel time across the vast area, reducing travel time to the site, improving the operator's working environment, and increasing work efficiency.

## Phase 3



### Final Phase

The ultimate concept is to further increase the number of remotely and automatically operable construction machines at the site, aiming to create a situation of unmanned operation, unconstrained by time or place. We believe this will contribute to resolving labor shortages, pursuing safety, and further improving productivity at the mine site. We aim for site DX that cannot be achieved with the remote control/automation of just one construction machine.

# Example of Expected Introduction at an Industrial Plant Site

## Phase 1



### Small Start - Proving value with just one machine

First, we start with remote control or automation of a single wheel loader or hydraulic excavator. We select tasks that are expected to be challenging, according to the site, after consultation. We address issues faced at each site, such as resolving high operation/high burden due to one-person operation, the burden of early morning/late night work, labor shortages, and operational efficiency. Based on the results obtained from handling one machine, the image of future possibilities/development, and the potential for safety improvement, we propose further site DX promotion.

## Phase 2



### Horizontal Expansion - Expanding to multiple machines, proposal for automation introduction

After confirming the practicality with one construction machine, we propose remote control or automation of the second and subsequent construction machines for specific work areas or specific sites. Remote control/automation of multiple machines involved in supplying fuel chips, transporting raw materials, and loading scrap leads to securing safety at the site, improving the operator's working environment, and enabling night and early morning work.

## Phase 3



### Final Phase

The ultimate concept is to further increase the number of remotely and automatically operable construction machines, aiming to create a situation of unmanned operation, unconstrained by time or place. We believe this will contribute to resolving labor shortages, pursuing safety, and further improving productivity at the site. We aim for site DX that cannot be achieved with the remote control/automation of just one construction machine.