The Technology for Improving Productivity & Safety in Tunneling Works

Steel Support Handling Machine

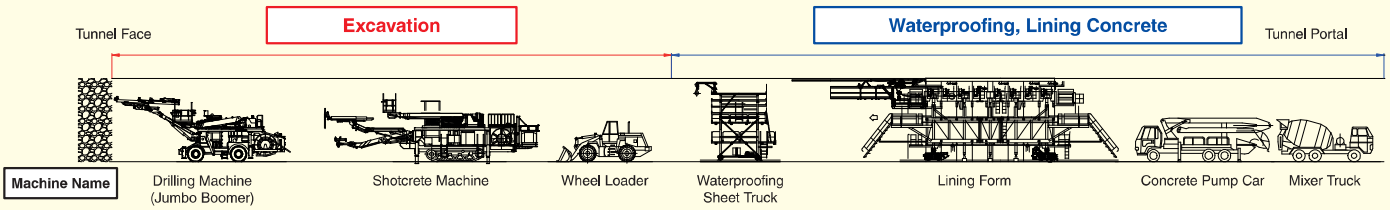
MAEDA

One operator can fix steel support without workers entering tunnel face.

INTRODUCTION

MAEDA CORPORATION developed the “Steel Support Handling Machine”. If you use this machine, you can minimize human works then prevent rock falling accidents.

Working Proceedure of NATM Tunnel



1. Drilling

2. Explosive Charge

3. Blasting

4. Mucking

5. Primary Shotcrete

6. Fixing Steel Support

7. Secondary Shotcrete
8. Rock Bolt

9. Waterproofing

10. Lining Concrete

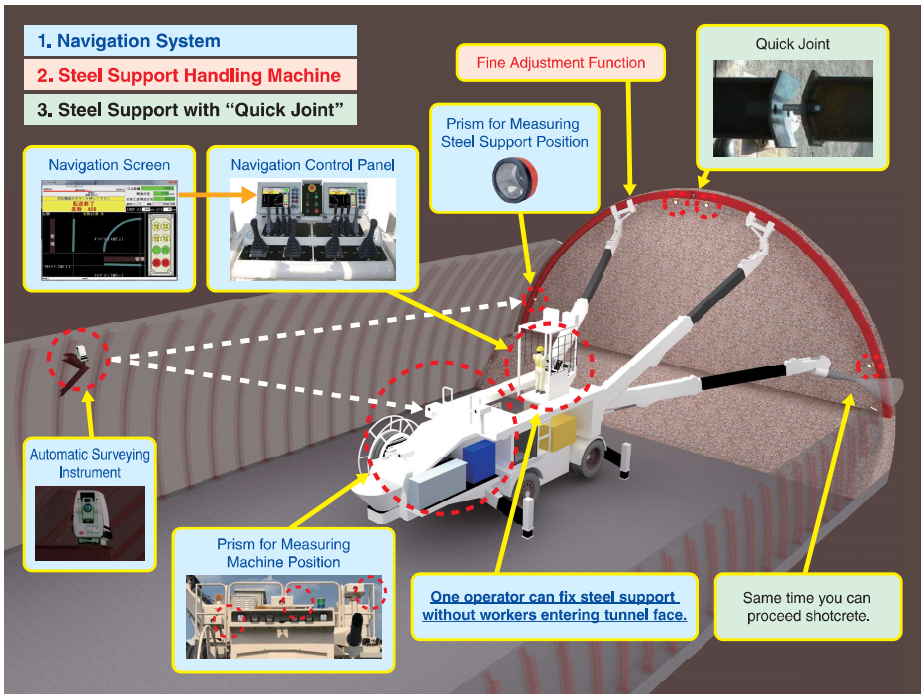
OVERVIEW

Without entering to tunnel face, operator can fix the steel support from cockpit by “Navigation System”. Steel support can be jointed by “Quick Joint” instead of nuts & bolts. Finally you can improve productivity with safety measures.

EFFECT

Improving Safety & Productivity

	Conventional Method	Our Method
Safety Improvement	4-Workers Working in Tunnel Face	No Worker Working in Tunnel Face
Productivity Improvement with Reducing Labors	 1-Operator, 4-Workers	 1-Operator



Steel Support Handling Machine

～"Zero" Entry Work at the Tunnel Face～

Automatic Explosive Charging System

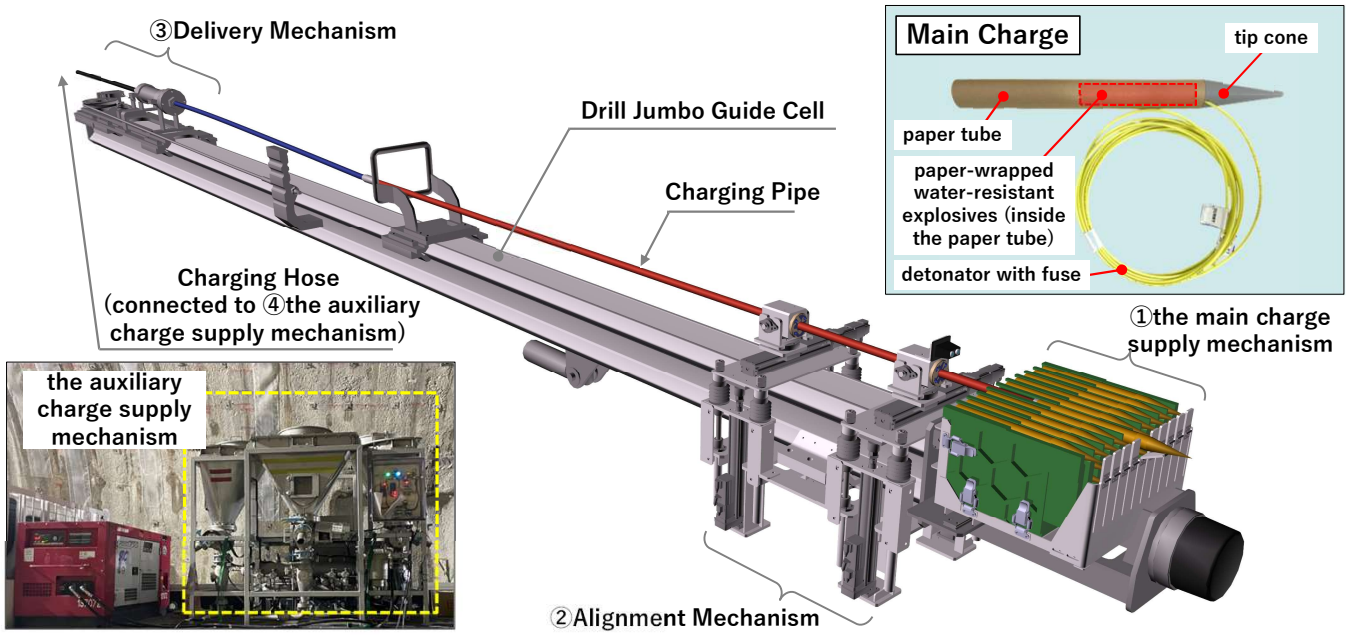
MAEDA

Significant improvement in safety through the automation of Explosive charging operations!

Maeda Corporation has developed the "Automatic Explosive Charging System" which enables charging work without entering directly beneath the tunnel face, to improve safety and productivity in conventional explosive charging operations.

Overview of the System

This system is mounted on the guide cell of a drill jumbo. The system consists of:
①Main charge supply mechanism ②Alignment mechanism ③Delivery mechanism ④Auxiliary charge supply mechanism
The main charge consists of water-resistant explosives and non-electric detonators, encapsulated in a cartridge with a tip cone that allows for alignment error tolerance and a paper tube for storage and gripping. The auxiliary charge uses granular explosives, enabling mechanical loading through air pressure for dense packing.

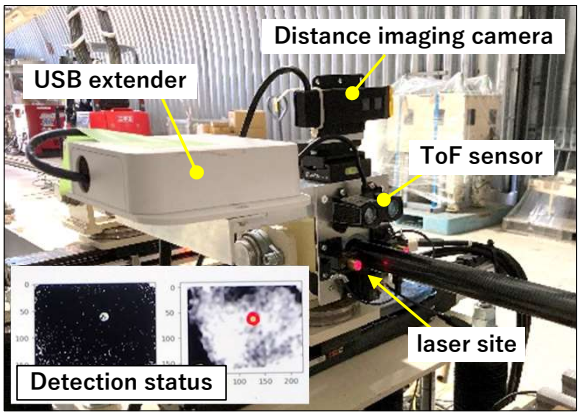


Features of the System

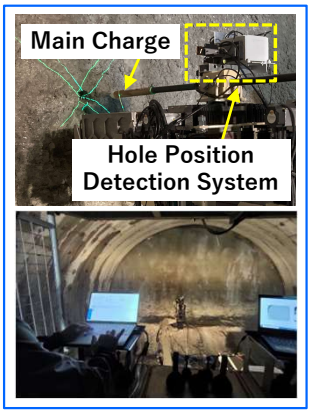
◆The drilling position (coordinates), angle, and depth are linked to the dedicated charging machine from the computer jumbo.
◆A newly developed hole position detection system accurately calculates the center coordinates of the drilled holes.

Automated Charging Procedure
①Rough alignment
②Acquire the center coordinates of the
③Pickup of the main charge
④Align to the acquired center coordinates
⑤Insert the main charge
⑥Charge the main charge using air pressure
⑦Charge the auxiliary charge
⑧Charging complete → Move to the next hole

Hole Position Detection System



On-site Test Construction (unmanned tunnel face)



Expected Effects After Implementation

・Safety Improvement

➤ Charge by machinery reduces the risk of rock fall accidents to "zero."

・Labor Reduction

➤ Reducing the number of personnel to a single operator: 5 → 1.