

Proposal for PHC Pile Bolt Assembly/Disassembly System using Robot and AI Vision

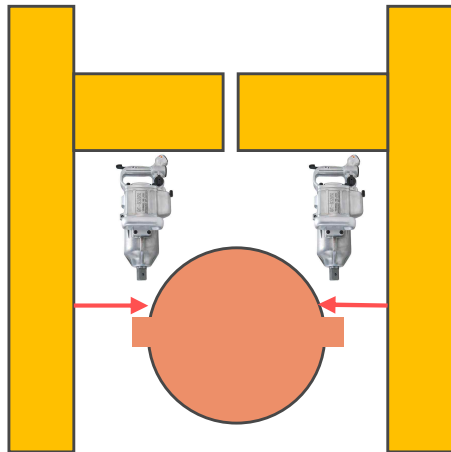
2023.3.



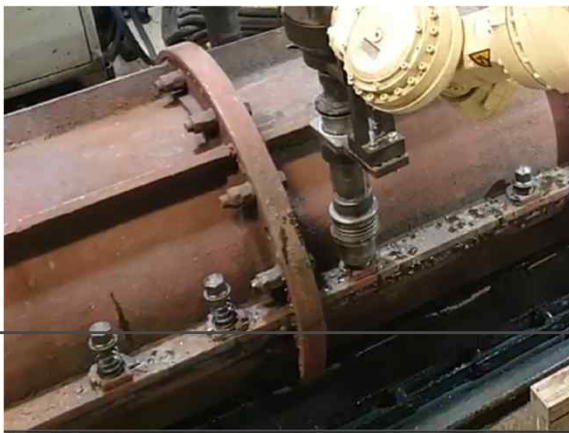
AUTOCONSYSTEM
www.autoconsystem.co.kr

[Generation of Bolt Assem./Disassem system]

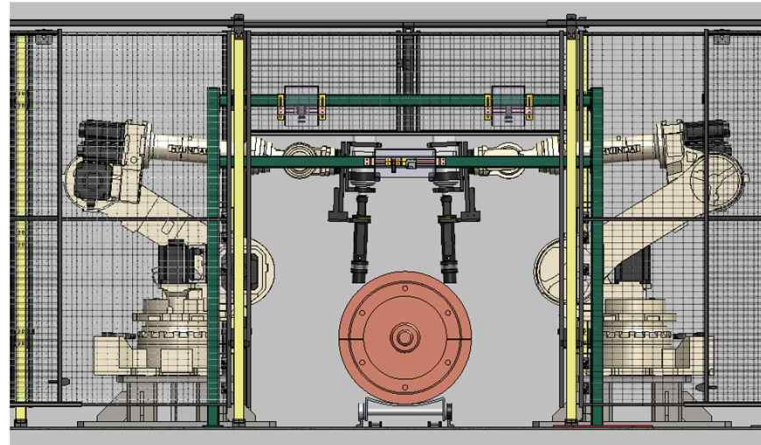
[Gen. 1]



- Mechanical
- 1-D Sensor

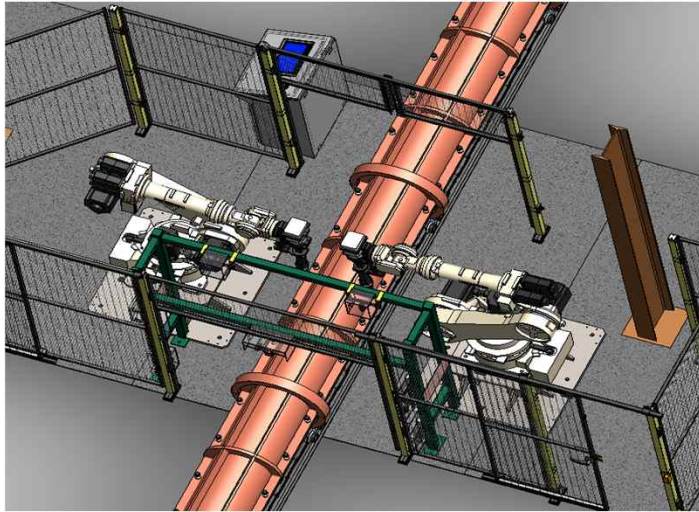


[Ge. 1.5] : '2021



- Robot System
- 1-D Sensor
- Safety System adapted. (PL e)

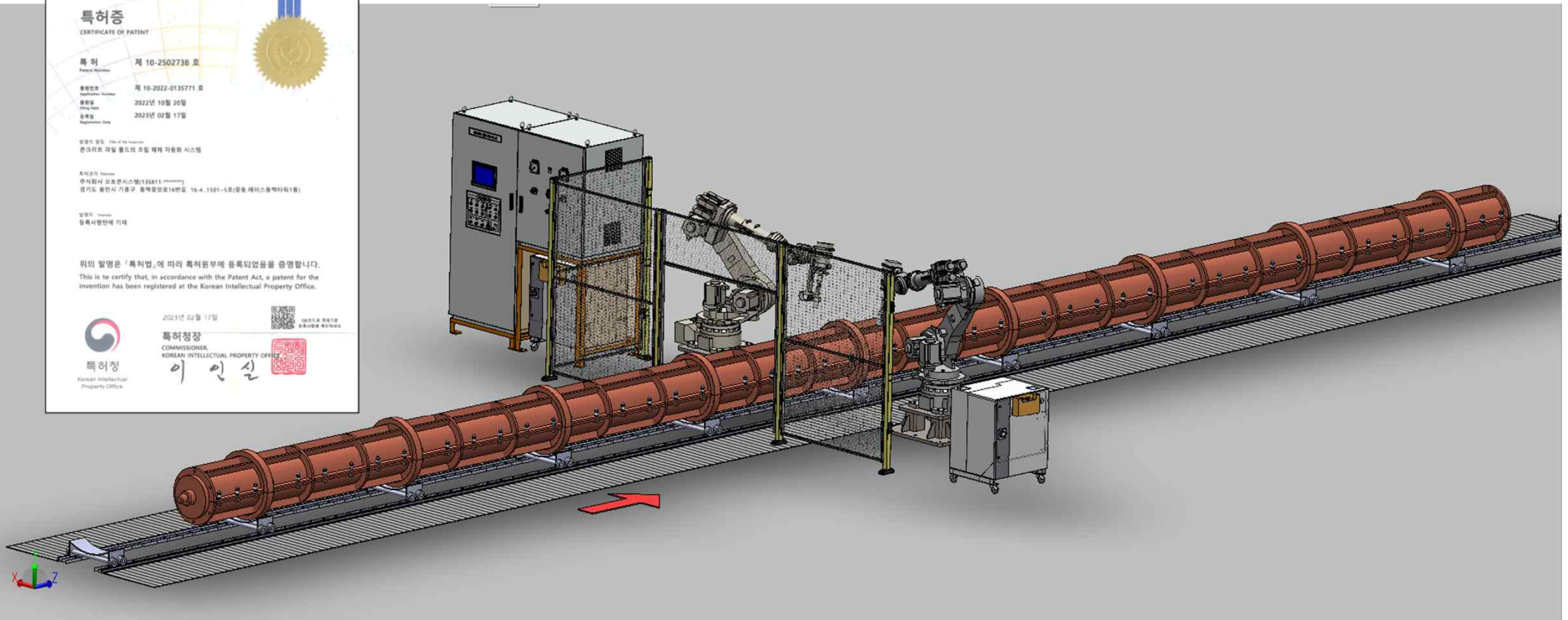
[Gen.2] AUTOCONSYSTEM Development: AI Vision Robot Bolt Assembly/Disassembly System (2022)



- Suitable for Progressive Deformation
- Oil Spray
(Controllable spray amount / Prevention of Pollution)
- Reduction of manpower
- Improved Assembly Quality (Uniformity of Assembling Torque)
- 2-D Bolt Detection
 - * AI Vision Development in Pile process (World First)
- Advantage in Versatile type Pile Manufacturing

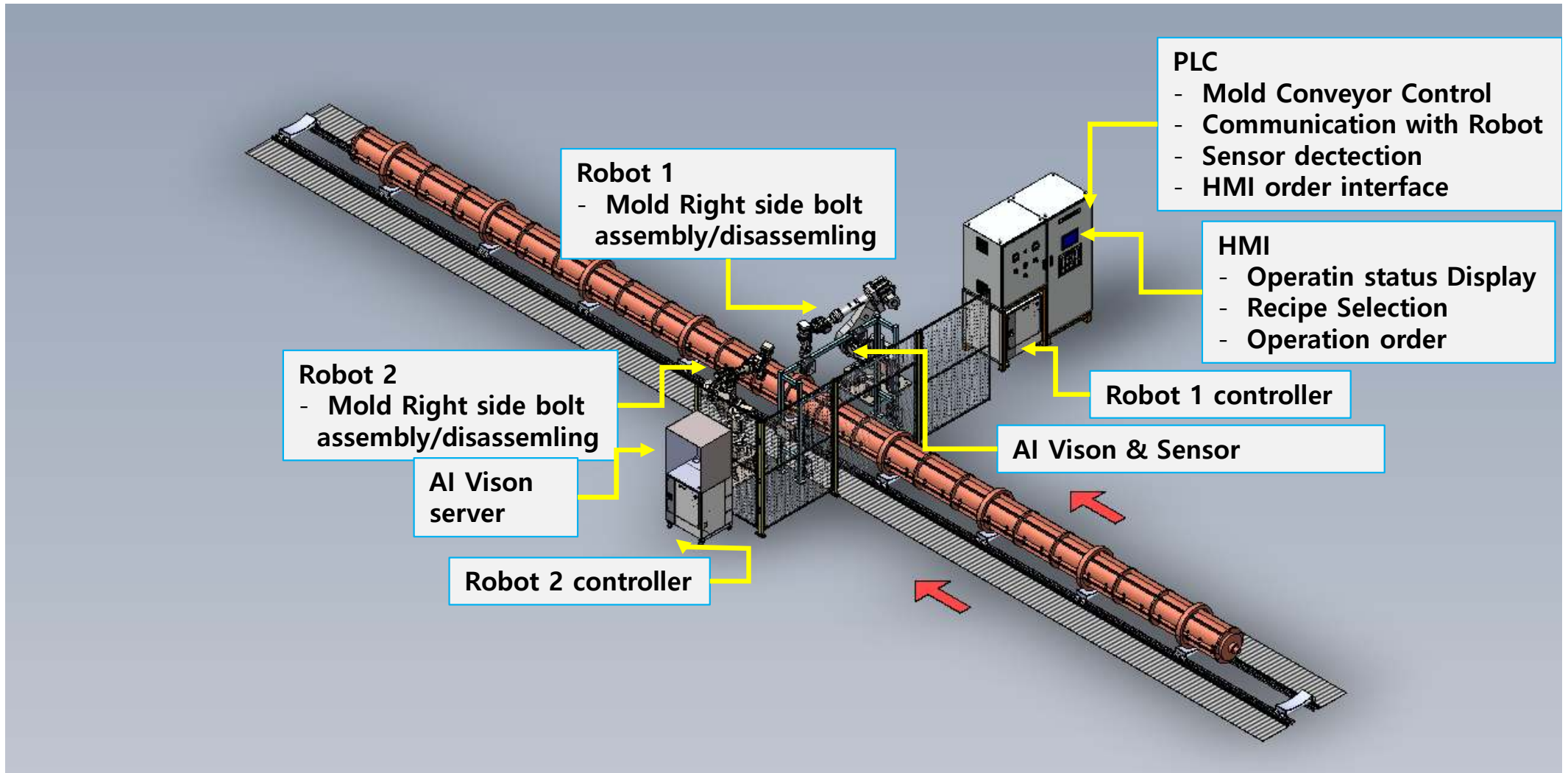
SMART FACTORY Connectivity

Patent 10-2502738

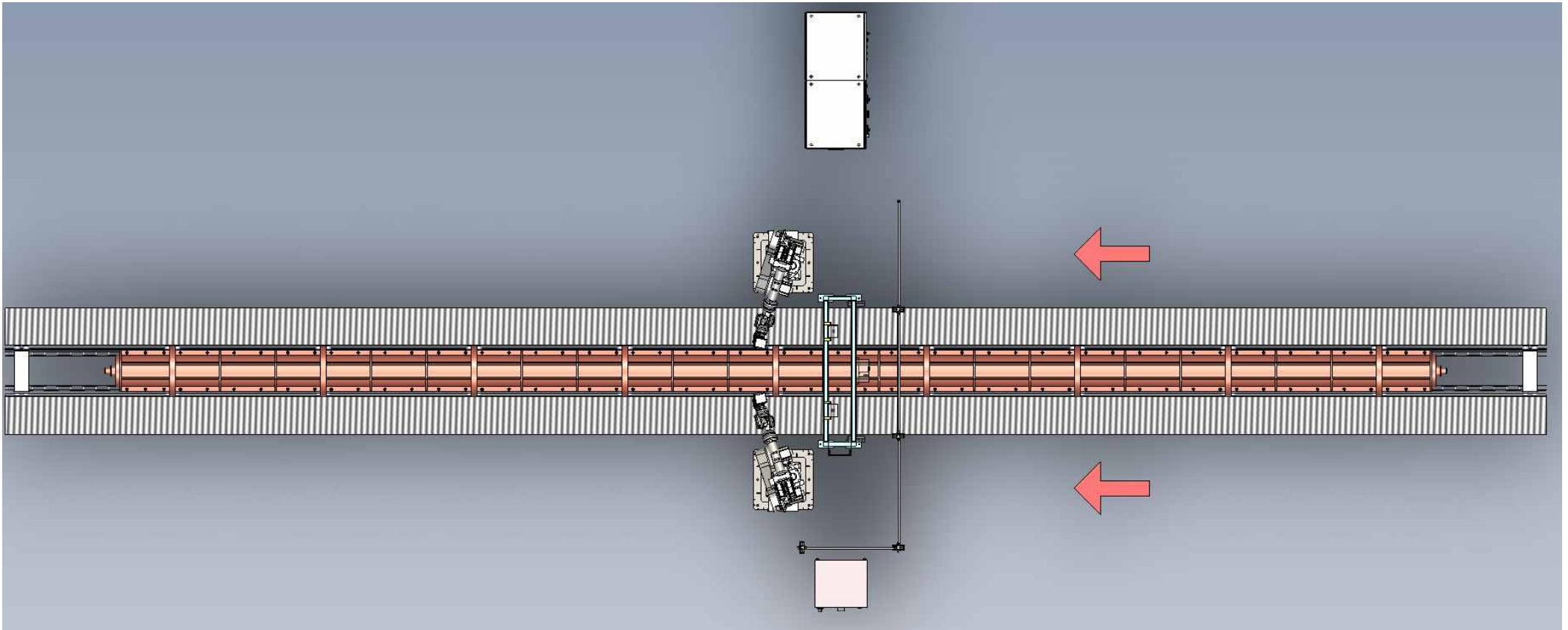


[PHC Mold Bolt Assembly/Disassembly AI Vison Robot System]

[System: Control Flow]

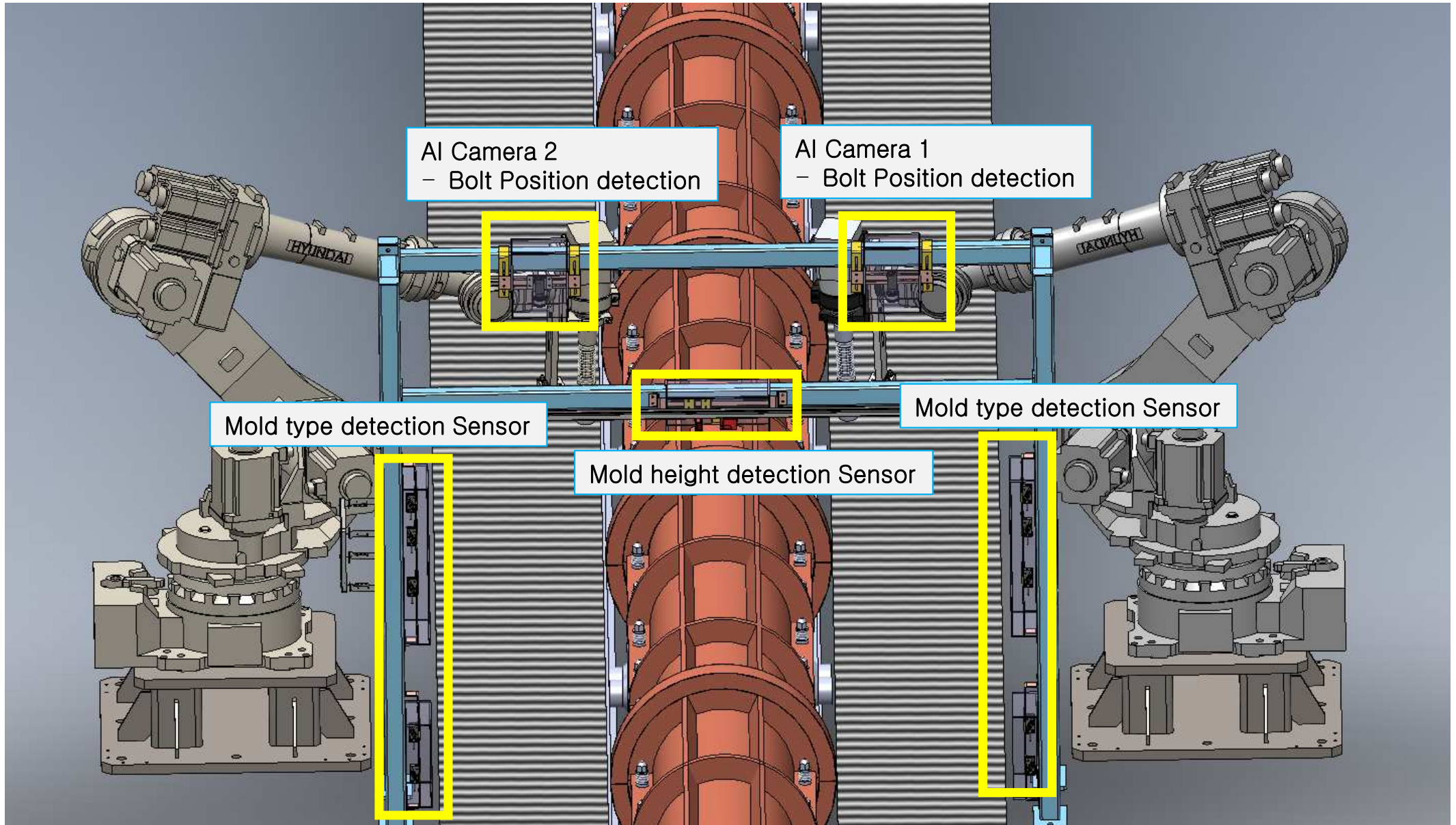


[System: Control Flow]

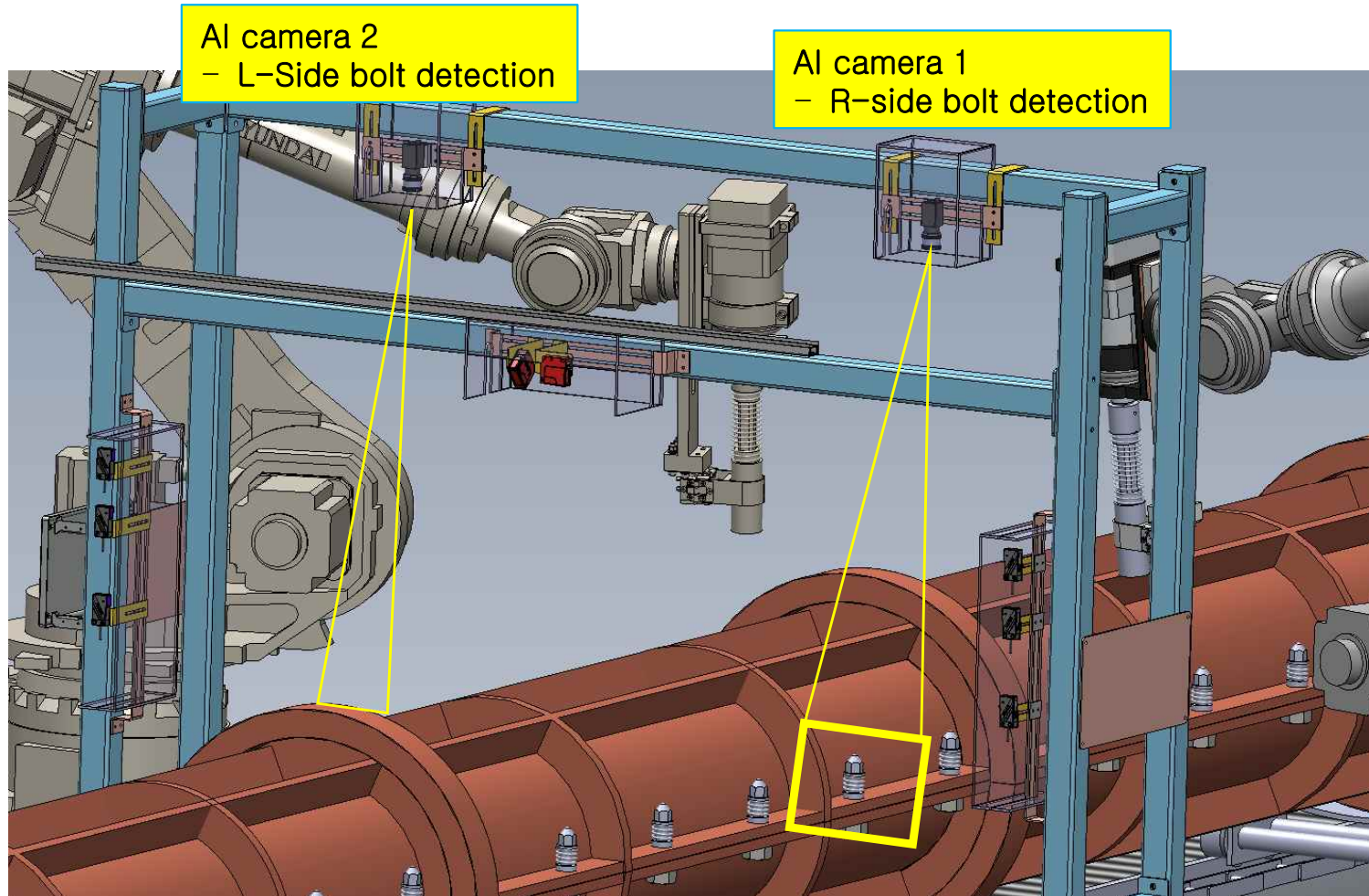


1. After confirming that the mold is seated on the conveyor, the operator presses the conveyor automatic start button to start the operation.
2. The type of mold is determined by the input sensor.
3. Bolt position detection using AI Vision
4. The robot assembles/Disassembles the bolts with conveyor tracking after receiving the bolt position signal.

[System: AI Vision sensor]



[System: AI Vision sensor]



The mold is injected, and the AI camera recognizes the bolt and delivers the position coordinates to the PLC. The height of the mold is recognized by the sensor and passed to the PLC. The robot receives information on the location and height of the bolt from the PLC and disassembles and assembles the bolt according to the conveyor speed.

[SYSTEM : AI Vision Bolt detection]

AI camera 2
– Bolt position detection

AI camera 1
– Bolt position detection

Bolt detection area

Bolt detection area

Bolt center position

Bolt center position

status : (236,407) IN REGION:1

status : (454,405) IN REGION:1

1. The AI camera looks for bolts in the designated area (FOV).
2. When a bolt is detected in the camera bolt detection area (ROI), the camera transmits the bolt coordinates to the PLC.
3. The PLC transmits the bolt position to the robot.

[Bolt Assembly/Disassembly Field Installation Case]

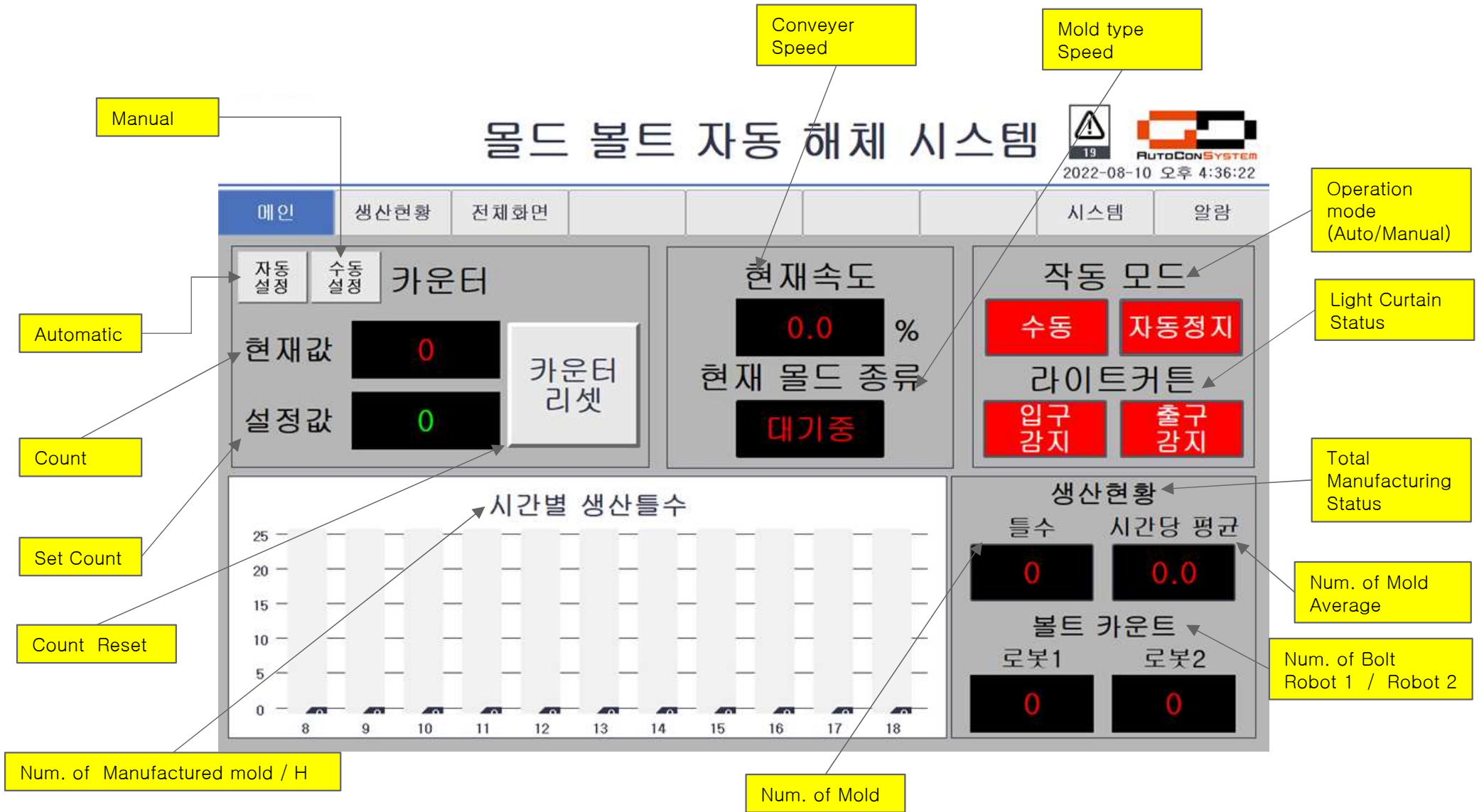
Bolt Assembly



Bolt Disassembly



[Bolt Assembly/Disassembly System HMI Example]

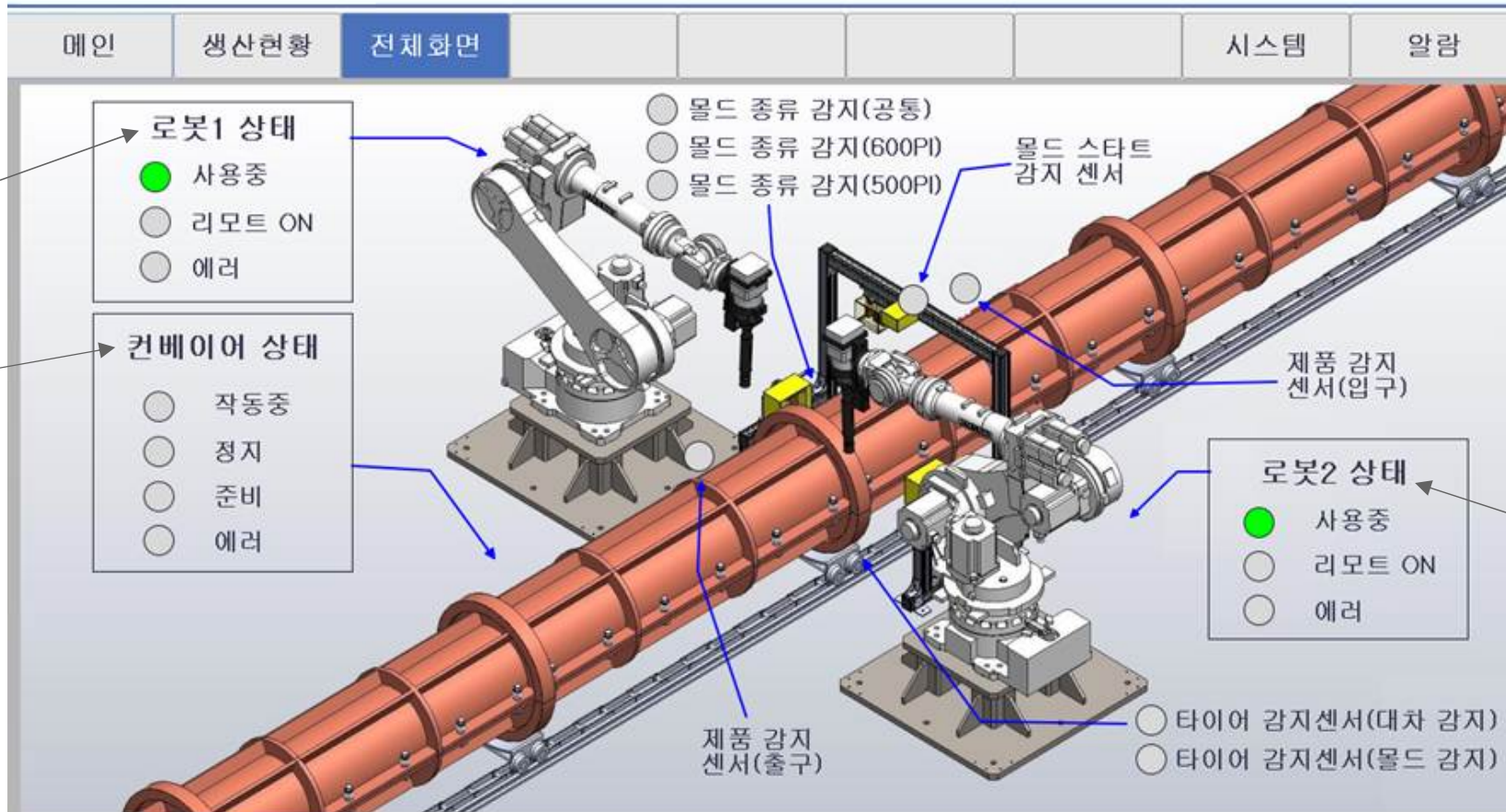


[Bolt Assembly/Disassembly System HMI Example]

몰드 볼트 자동 해체 시스템



2022-08-10 오후 4:38:00



Robot 1 Status

Conveyor Status

Robot 1 Status

[Features]

1. By using the robot, it is possible to work without changing the instrument settings even if the mold size changes
2. The sensor detects the size of the mold and automatically recognizes the mold type.
3. Non-skilled personnel can operate the system using HMI
4. The position detection of bolts using AI vision enables the detection of bolts regardless of mold size/position change due to wear and deformation.
5. Low maintenance costs for replacement due to wear using off-the-shelf vox sockets.
6. Extend impact life by using high-speed/high-torque , Reduce Impact Replacement Costs
7. Prevent contamination in the workplace by spraying the minimum amount of bolt oil and extend the life of the mold with constant assembly torque

[Installation case & Expedted Benefit]

[Installation Case]

1. 'I' company 'C' Factory : Assem. 2 line, Disassem. 2 line ('2022)

'I' company 'E','C' Factory : 6 Line planed ('2023)

'K' company 'D' Factory : 2 line planed ('2023)

'D' company 'A' Factory : 2 line planed('2023)

[Expected Benefit]

1. Unmanned or de-manufactured workers on assembly and disassemble lines
2. Prevention of musculoskeletal disorders in workers
3. Improving mold quality by equalizing assembly quality of assembly process
4. Manufacturing data can be linked to high-level Server

[Building/Installation time & Cost]

1. Building/installation time : 8 ~12 month

- Building : 6 month(Depend on parts lead time)
- Commission : 2 month

2. Building/installation Cost : ₩290,000,000 Won

- Payment terms: 60% on order, 30% on delivery, 10% on completion

[Scope of supply]

Robot/Vision/Panel/Fence

Supplier

Pneumatic 7.5bar & Piping

Customer

Electric Power 3-phase 220V

Customer (380-220 Tr. Supplier)

Robot foundation Construction

Customer

Power cable tray Construction

Customer

Encoder attachment on Conveyor

Customer (Encoder Supplier)

3. Investment effect (based on 1 assembly line)

1) Number of people reduced: 2 → 0.2

Investment effect: 1.8 x 50 million won = 90 million won/year

* Return on investment: 3.2 years

2) Improved mold quality

Assemble molds with constant torque → Extend mold and mold bolt life

3) Prevention of musculoskeletal disorders in workers

4) Avoidance job → Preferred job conversion (relaxation of labor intensity)

Resolving job shortages/helping to maintain employment (elderly and female employment can be hired)

5) Extended Consumables Life

Vox Socket Life Extension → Consumables Cost Reduction

Using big impact → Extended life / reduced impact cost

Optimization of bolt oil injection: Reduction of oil use,
prevention of contamination in the factory

[Bolt Assemble/Disassemble Field Installation Case]

[Bolt Assemble & Oil spray video]

YouTube: “autoconsystem” searche

<https://www.youtube.com/watch?v=yGTtPx2q-IU&t=48s>

[Bolt Assemble/Disassemble Field Installation Case]

[Bolt disassemble & AI vision video]

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THANK YOU !

Q & A ?