



# SS Engineering

## Crane Real Time Monitoring to Reduce Maintenance High Risk Job



Monday, August 26<sup>th</sup>, 2023

# **Personal Profile**

## **PT. TOYOTA MOTOR MANUFACTURING INDONESIA**



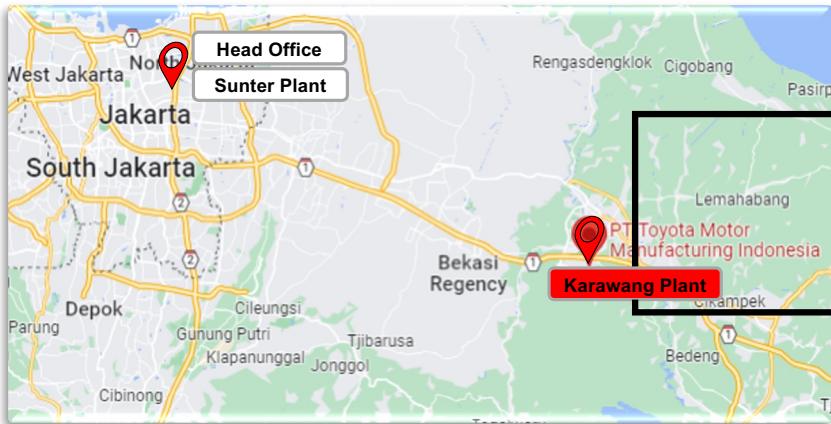
**PRESS & WELDING PRODUCTION DIVISION  
PRESS WELDING MAINTENANCE & WORKSHOP DEPARTMENT  
SPAREPART & WAREHOUSE SECTION**

- |                        |  |
|------------------------|--|
| <b>- . 2014</b>        | <b>: Join TMMIN</b>                          |
| <b>- . 2014 - 2019</b> | <b>: Press Maintenance Engineering Staff</b> |
| <b>- . 2019 - 2022</b> | <b>: Maintenance Development</b>             |
| <b>- . 2022 - Now</b>  | <b>: Spare Part &amp; Warehouse</b>          |
|                        | <b>: DX Development</b>                      |

**I Gusti L. Wahyudi Indrawan**

# Workplace Introduction

PT. TMMIN



## PRODUCT

P #1



Innova  
Reborn



All New  
Fortuner



Innova  
Zenix

P #2



New  
Calya

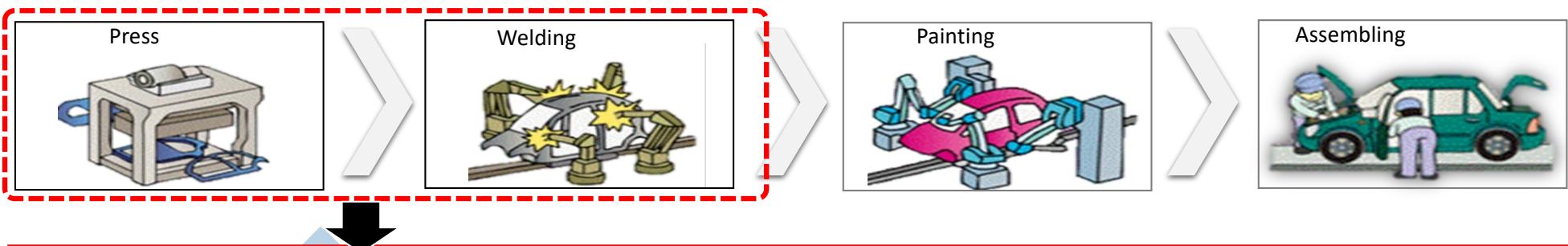


New  
Yaris GR



All New  
Veloz

## KARAWANG PLANT GENERAL FLOW PROCESS

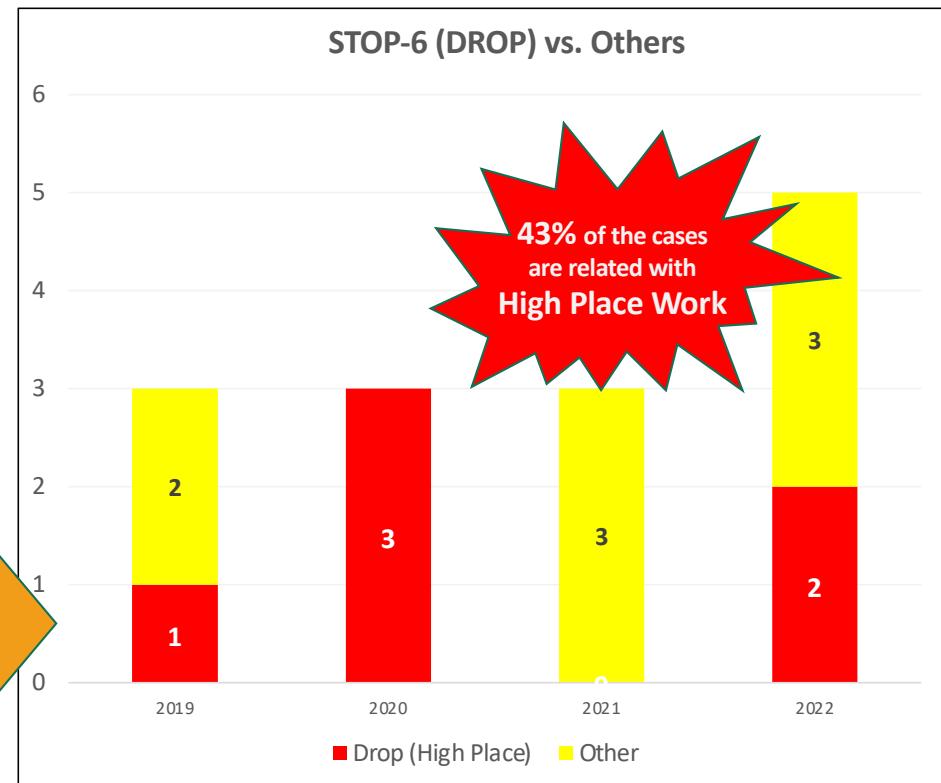
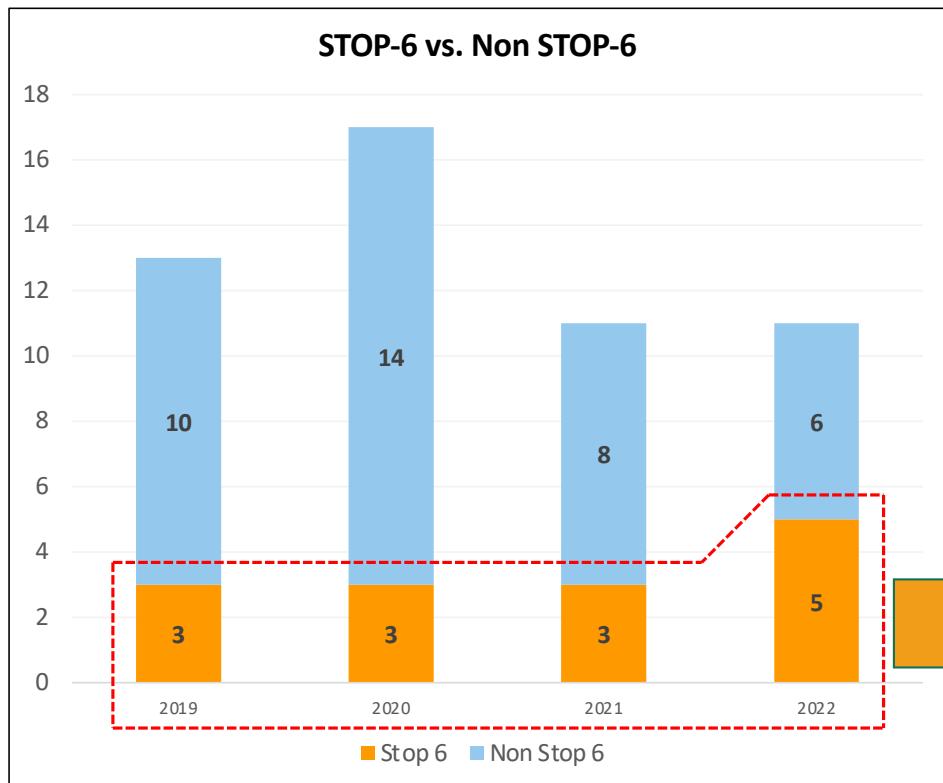


Activity Area :

**PRESS WELDING PRODUCTION DIVISION, MAINTENANCE DEPARTEMENT**

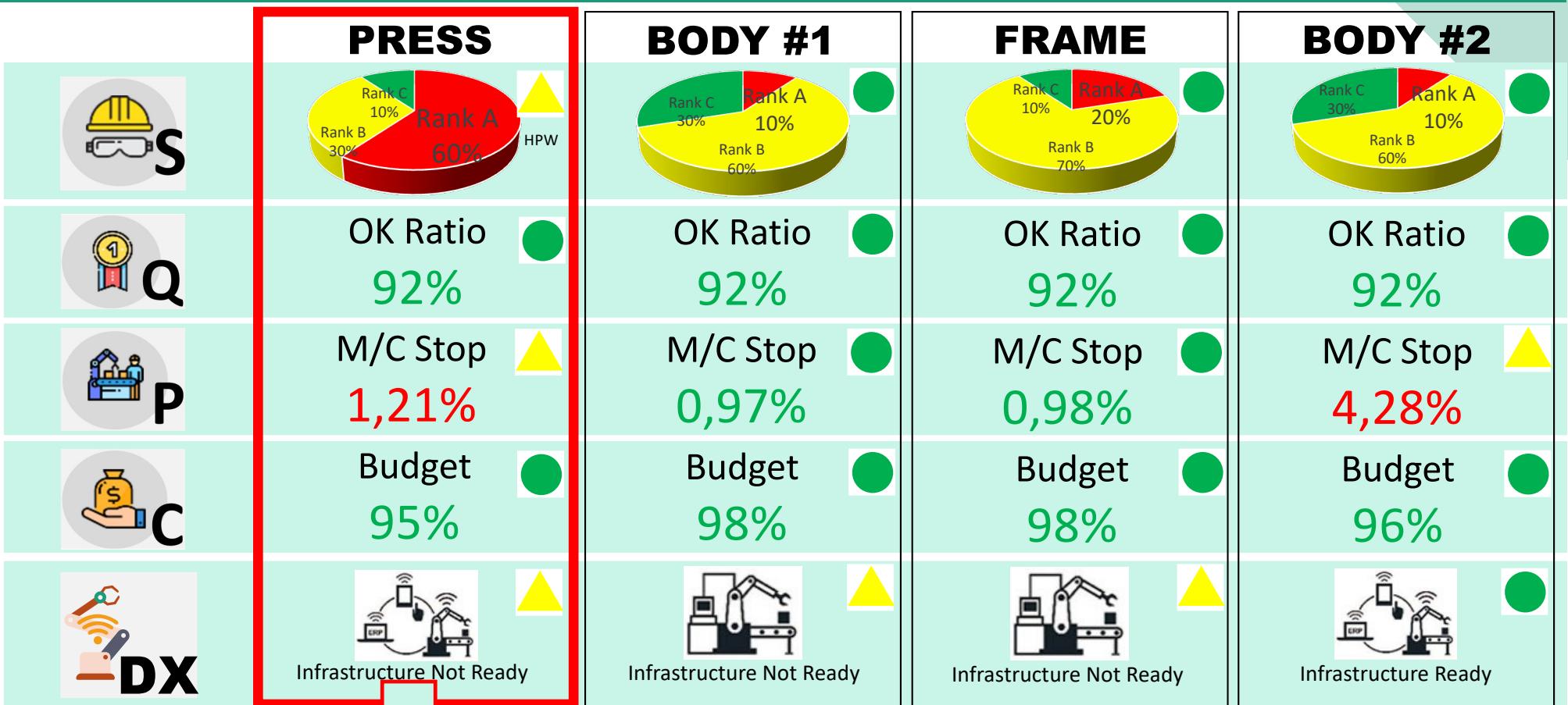
# 1. BACKGROUND [Global]

## AP INCIDENT STATISTIC



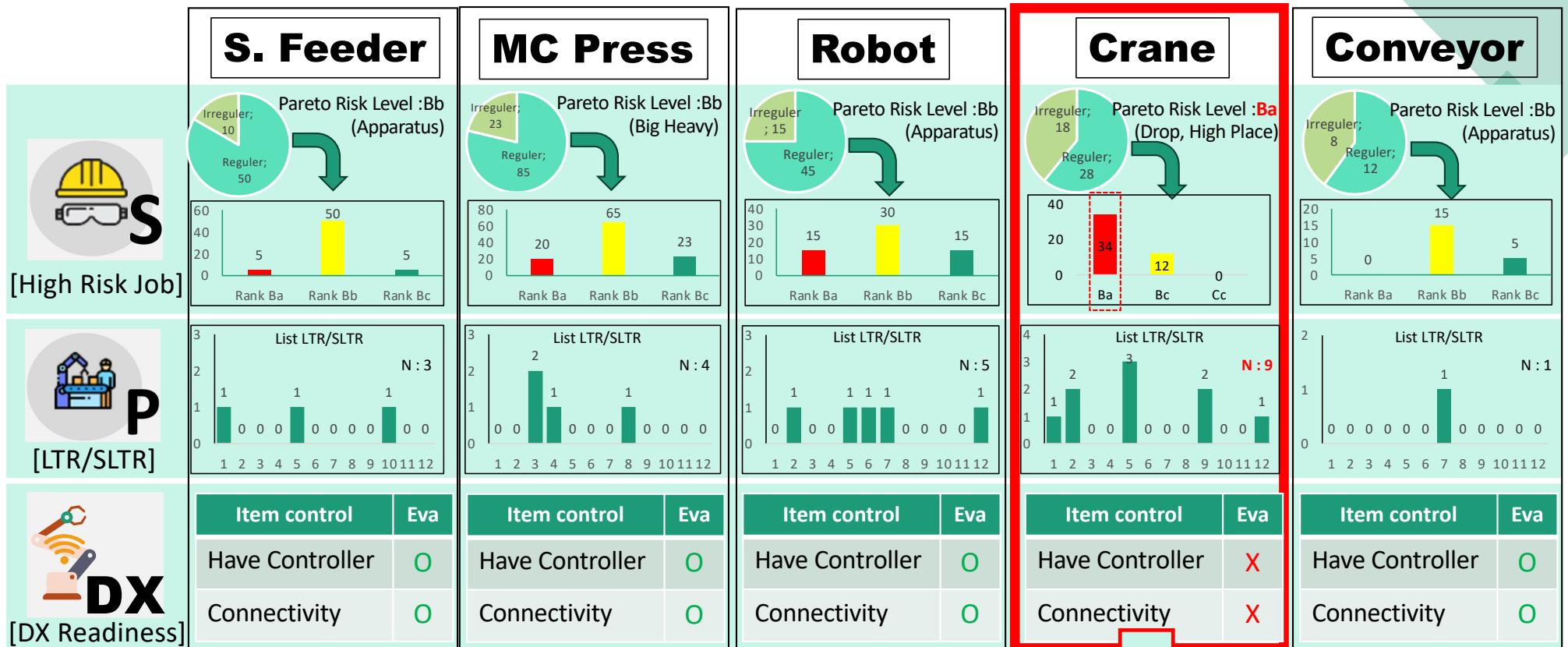
High Place Work still need more attention since they are contributing to 43% of STOP-6 related accident

# 1. BACKGROUND [Shop]



PWPD consist of 4 Shop and based on KPI Matrix Achievement (S,Q,P,C,DX Readiness), can be seen that **PRESS SHOP** is still struggling in **Safety & Productivity**

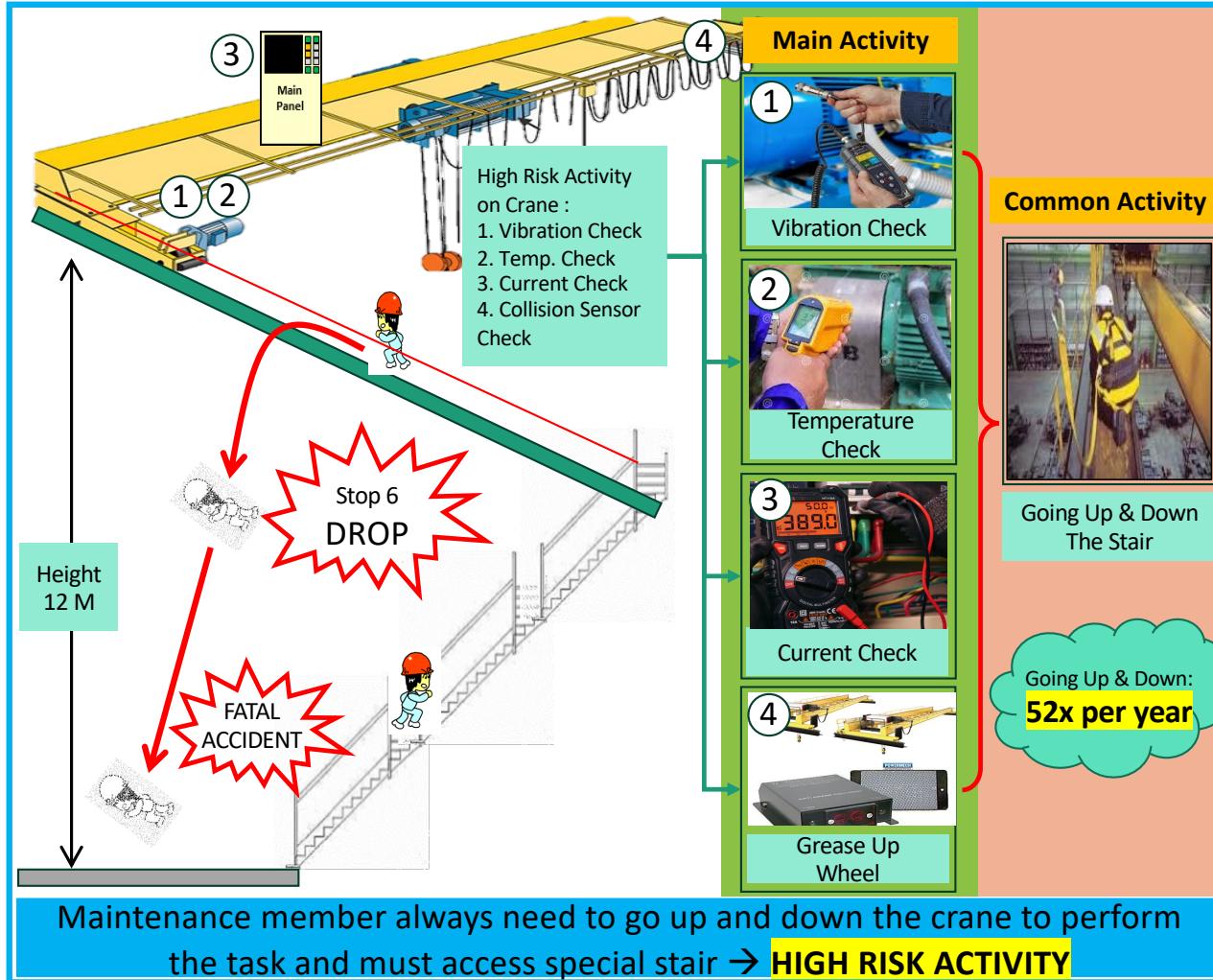
# 1. BACKGROUND [Machine]



There are 5 Core Machine in Press Shop (S. Feeder, MC Press, Robot, Crane, & Conveyor). Grasping have been done and can be seen that Crane has more high risk job, more LTR/SLTR, and not ready for DX Implementation.

**CRANE is challenging development**

## 2. GRASPING SITUATION [High Risk Activity]



### [INSPIRATION]



From DRONE, I observe that wherever it is flying, all the drone information can still be monitored from the controller at ground level.

From inspiration then comes the idea:

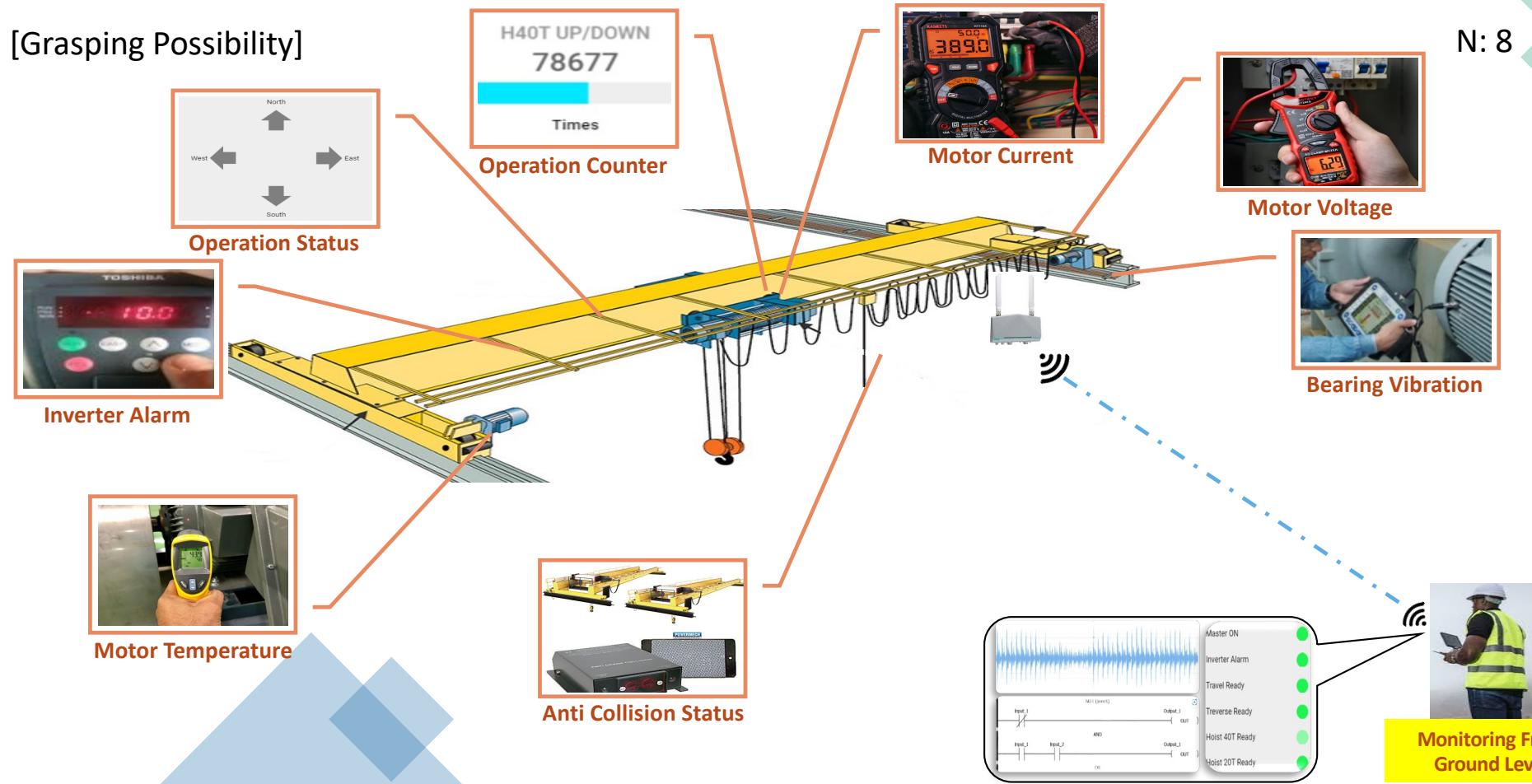
**Crane Real Time Monitoring to Reduce High Risk Maintenance Job**

## 2. PROPOSED IDEA

[REALIZING THE INSPIRATION]

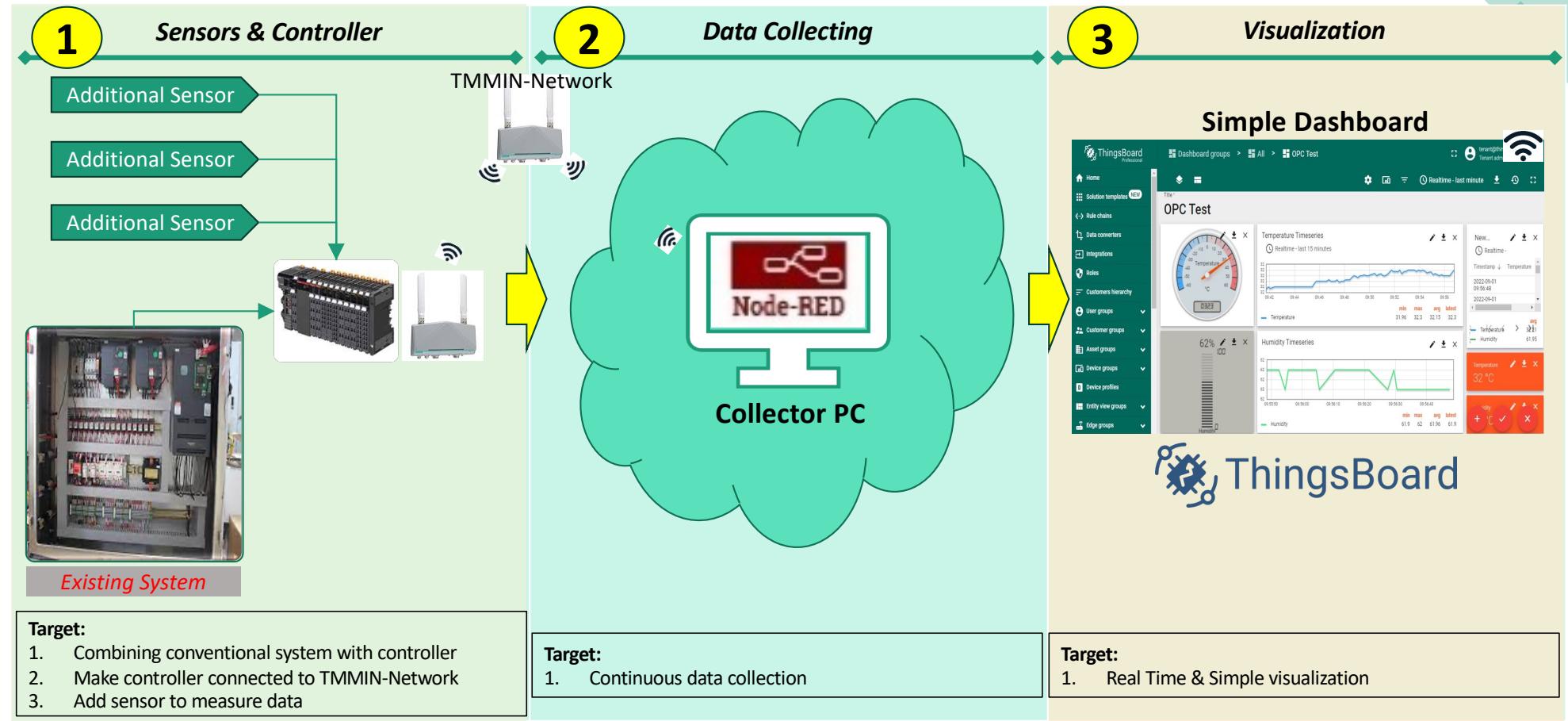
[Grasping Possibility]

N: 8



## 2. PROPOSED IDEA

### [SYSTEM TOPOLOGY – REAL TIME MONITORING]

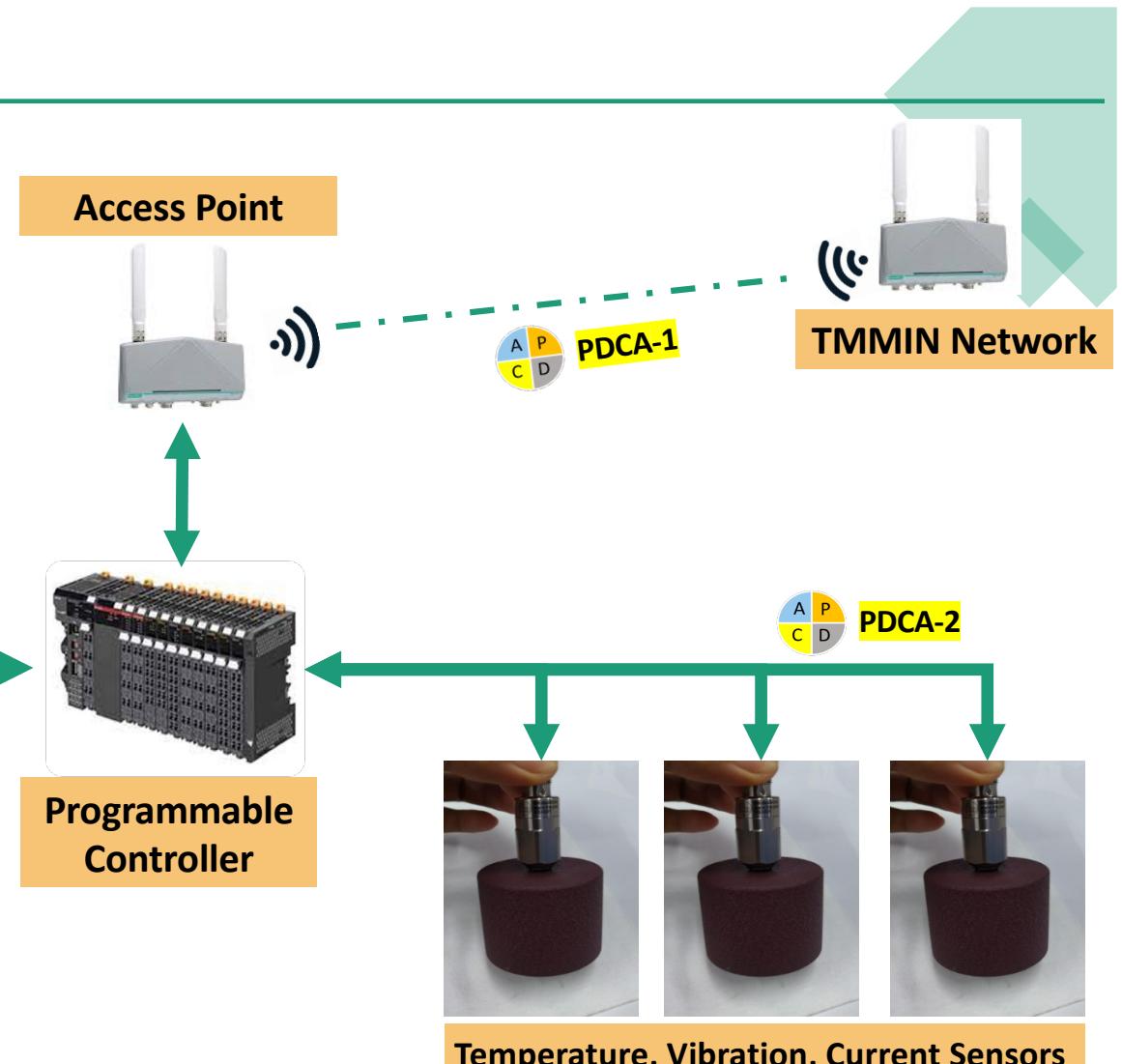


## 2. PROPOSED IDEA

### 1 Sensors & Controller



Existing Crane Conventional Control System

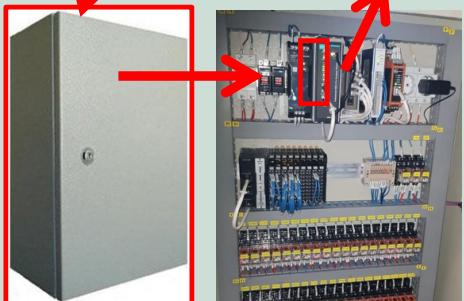


Temperature, Vibration, Current Sensors

## 2. [PDCA 1] Wi-Fi Signal Strength

- ❖ Low Wi-Fi signal in some area
- ❖ Signal lost (no connection)

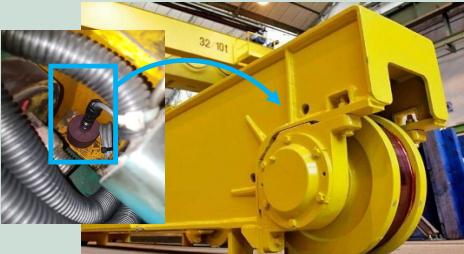
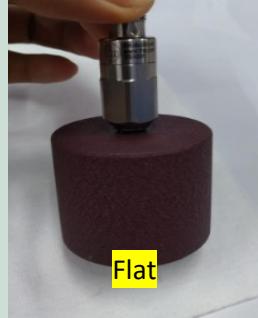
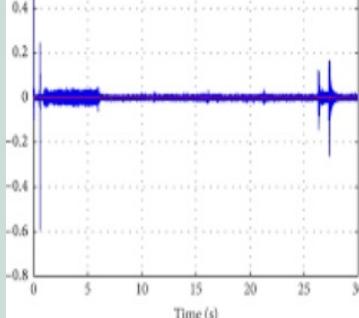
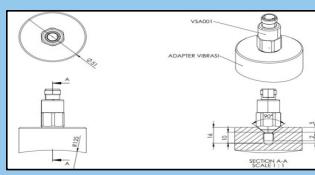
### TRIAL RESULT [PDCA 1]

BEFORE	PDCA			AFTER
  Wi-Fi Router installed Inside the Panel.	 <b>KADAI</b> How To Strengthen Wi-Fi Signal?  Inside Panel	<b>ANALYZE</b> - Wi-Fi Router installed inside the panel. Metal Panel resist Wi-Fi Signal 	<b>IDEA</b> A P C D - Add extension antenna and put them outside the panel  Outside Panel	  Add wire extension & make hole, so that antenna appear outside of the Panel

## 2. [PDCA 2] Sensor Placement Issue

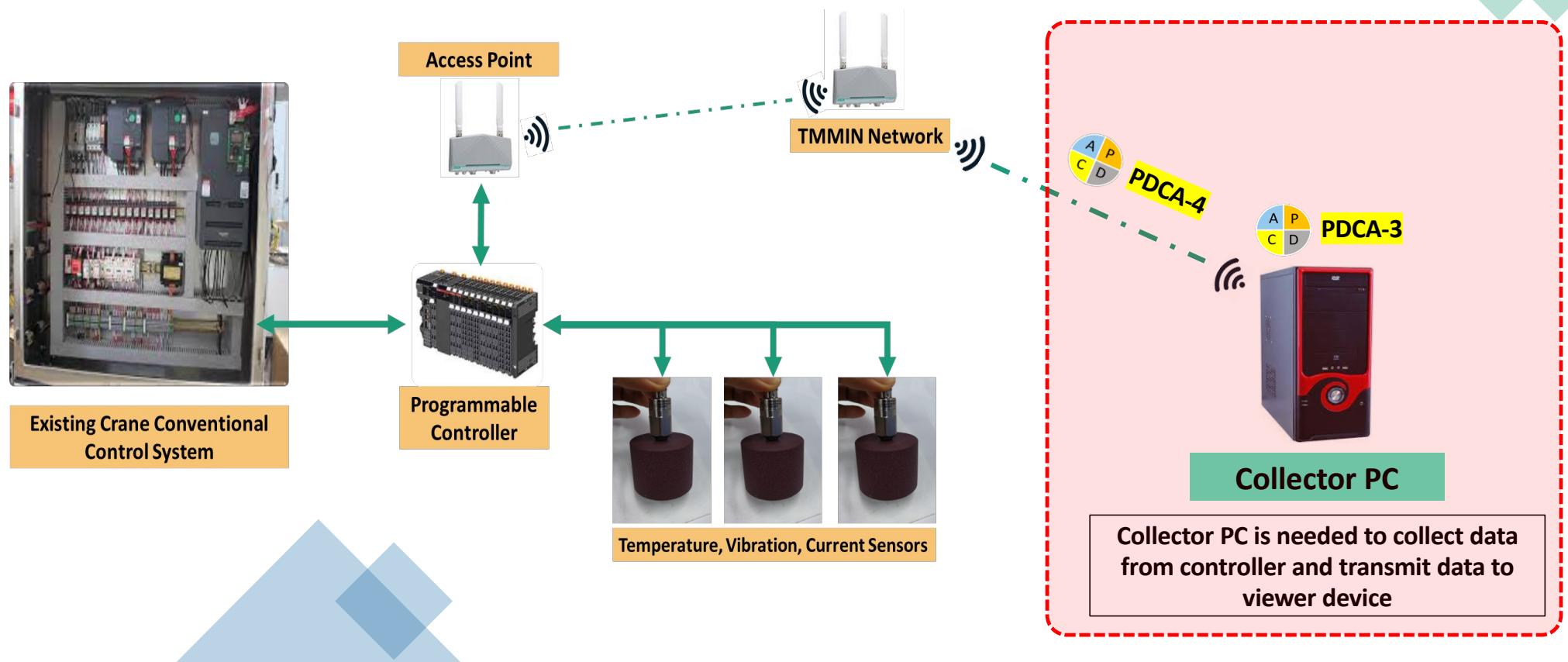
- ❖ Weak sensor attachment
- ❖ Inaccurate sensor reading

### TRIAL RESULT [PDCA 2]

BEFORE	PDCA			AFTER
 <span style="border: 2px solid red; border-radius: 50%; padding: 2px;">X</span> Sensor Placed On The Girder	 Flat	 Time (s)	<b>IMPACT</b> <ul style="list-style-type: none"><li>- Flat adaptor surface make it easy to fall</li><li>- Axial mounted sensor resulting inaccurate reading</li></ul> 	 <span style="border: 2px solid green; border-radius: 50%; padding: 2px;">O</span> Sensor Mounted Radially
 <span style="border: 2px solid red; border-radius: 50%; padding: 2px;">X</span> Sensor Mounted Axially	<b>KADAI</b> How to make appropriate sensor placement 	<b>ANALYZE</b> <ul style="list-style-type: none"><li>- Flat sensor adaptor surface make it hard to attach and give inaccurate reading</li></ul>	<ul style="list-style-type: none"><li>- Modify adaptor to match Plummer block radius</li></ul>  	

## 2. PROPOSED IDEA

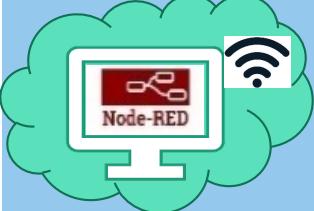
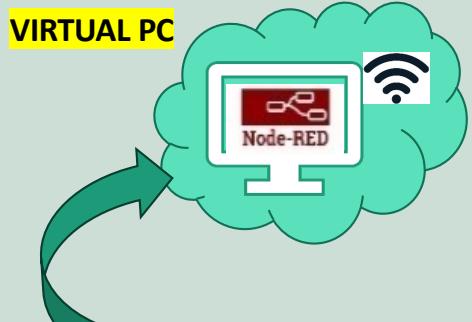
### 2 Data Collecting



## 2. [PDCA 3] Data Collector PC

- ❖ Need PC to transmit data into the dashboard
- ❖ The PC must have internet connectivity

### TRIAL RESULT [PDCA 3]

BEFORE	PDCA			AFTER	
<b>PHYSICAL PC</b>   Trial to use physical PC to collect and transmit data	Physical PC  X 	<b>KADAI</b>  How to collect and transmit data without installing PC on the crane.	<b>ANALYZE</b> -. PC is needed to collect and transmit data -. Crane is always moving and vibrating -. Vibration is not good for PC in the long term  	<b>IMPACT</b> Physical PC is not suitable to handle crane vibration in the long term  -. Study with ISTD team to run the data collecting and transmitting software in <b>VIRTUAL PC</b> 	<b>VIRTUAL PC</b>   Use virtual PC to collect and transmit data

## 2. [PDCA 4] Wireless Connectivity

- ❖ IP Address set automatically to Dynamic IP
- ❖ Connectivity unstable (connect/disconnect)

### TRIAL RESULT [PDCA 4]

BEFORE	PDCA			AFTER
<p>IP ADDRESS : 10.64.108.22 → IP ADDRESS : 10.64.108.30</p> <p>TMMIN WIFI                    TMMIN WIFI</p> <p>IP Address always change when Crane Moving, make connection unstable (connect/disconnect)</p>	<p>KADAI</p> <p>How to keep IP address fix?</p> <p>ANALYZE</p> <p>-.. Setting IP from PLC to Wireless router, default is Dynamic IP IP: 10.64.108.22 IP: 10.64.108.35</p> <p>IDEA</p> <p>-.. Request ISTD Team to study &amp; define designated Static IP Address for PLC Access Point IP: 10.64.108.31</p>	<p>IMPACT</p> <p>IP Address always change if reconnection (Data can't transferred)</p>	<p>IP ADDRESS : 10.64.108.22 → IP ADDRESS : 10.64.108.22</p> <p>TMMIN WIFI                    TMMIN WIFI</p> <p>Change IP Address to Static IP, so even Crane Moving, IP Address always same with first setting</p>	

## 2. PROPOSED IDEA

[PDCA RESULT] Confirmation

### Countermeasure Summary

Kadai	Countermeasure	Collaboration with	Eva
1. Signal Strength Issue	Add. Extension wire & Modify Antenna Hole	Maintenance Team	O
2. Sensor Placement Issue	Modify sensor adaptor for appropriate placement	Engineering Team	O
3. Data Collector PC Issue	Replace physical PC with virtual PC	ISTD Team	O
4. Wireless Connectivity Issue	Study & purpose designated static IP	ISTD Team	O

**SUCCESS**



### Share to other area



Sharing to All Maintenance Member

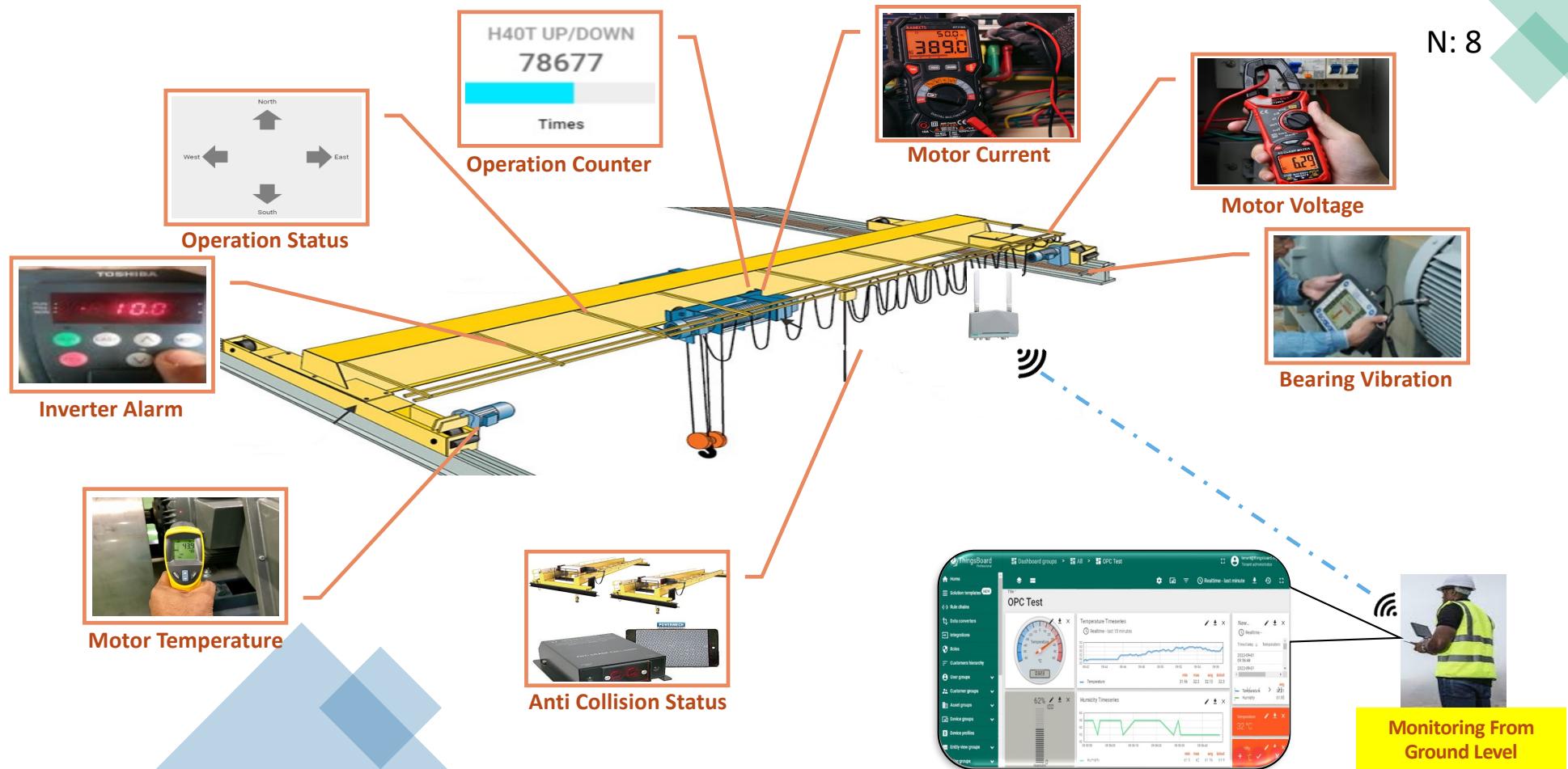


Sharing to Production & Engineering

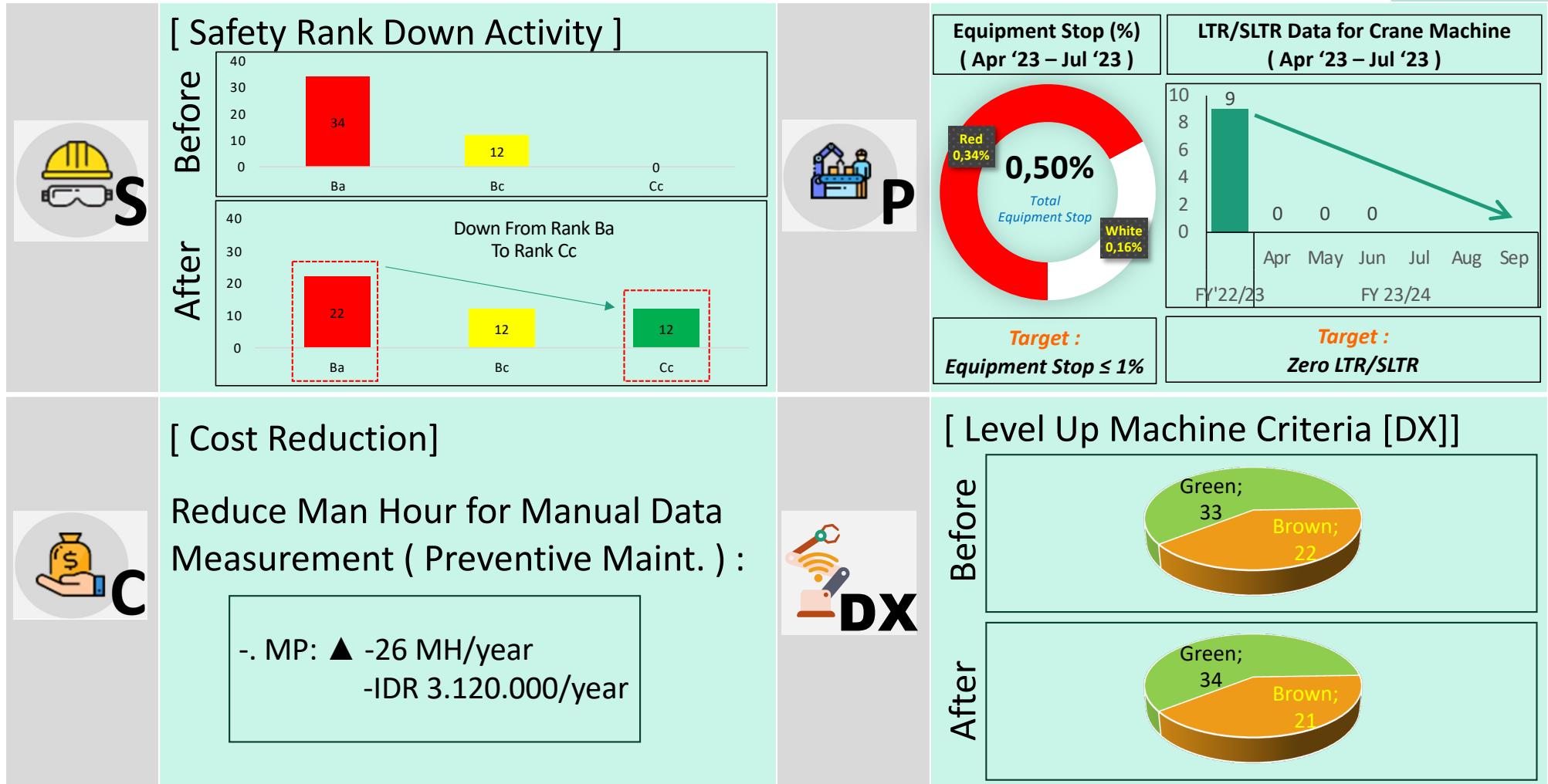
Sharing to Affiliate as a **New Breakthrough Idea on Crane**

### 3. FINAL RESULT

#### [SUMMARY OF IMPROVEMENT RESULT]

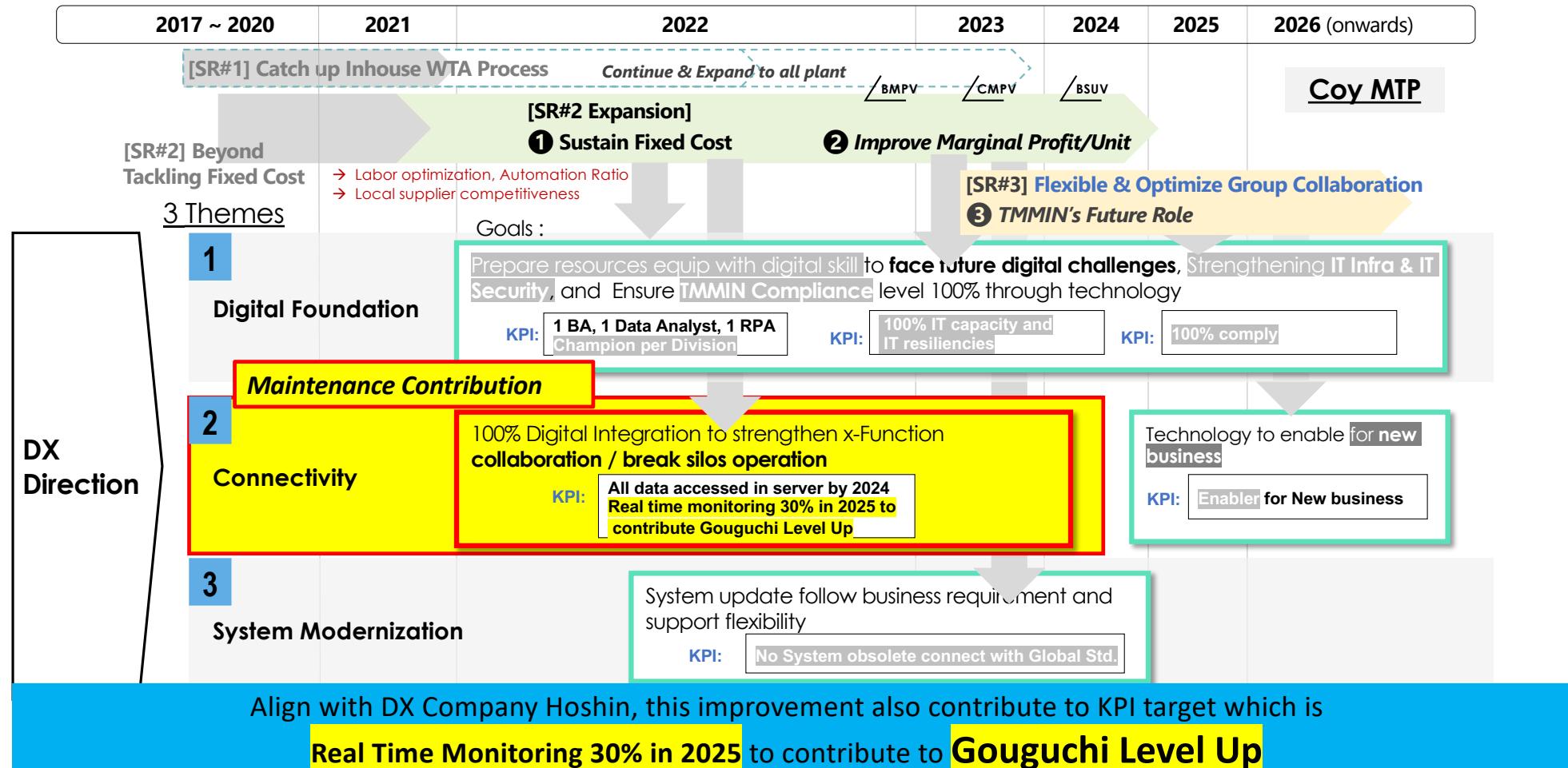


## 4. BENEFIT OF IMPROVEMENT



# 4. BENEFIT OF IMPROVEMENT

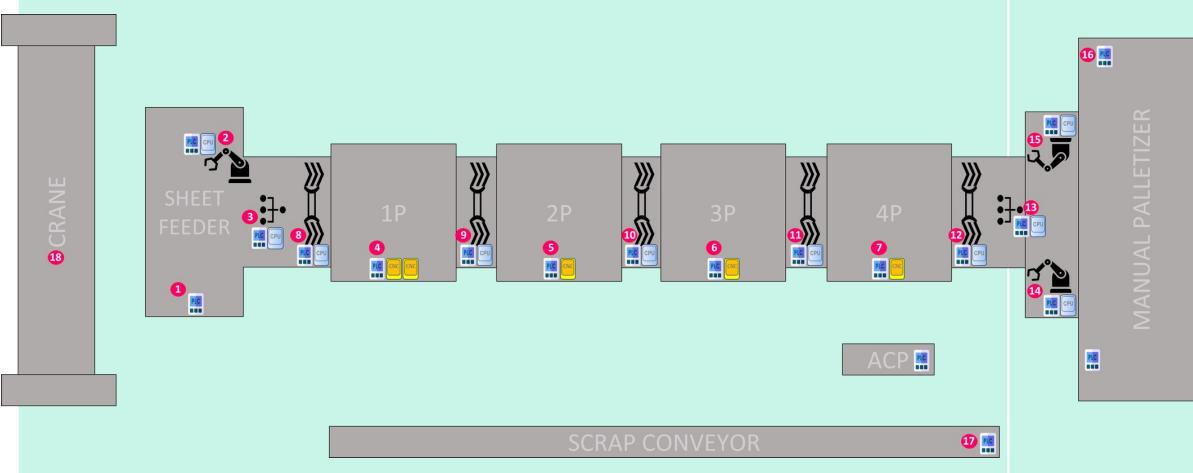
## Milestone - DX COMPANY HOSHIN



# 5. YOKOTEN ACTIVITY

Get Connected 100% 5A Line A Rank Equipment on FY23-24 to provide machine data for further utilization

## Line Visualization



## Objective

1. Real Time Monitoring	2. KPI Monitoring	3. Planned Maintenance
*Early, accurate, and detail BNF	*Accurate weakness analysis *Specific action plan trigger	<b>3.1 Preventive Maintenance:</b> *Accurate check period, avoid miss planning, automatic achievement report, reduce MH <b>3.2 Predictive Maintenance:</b> *Early abnormality detection, reduce MH, planned spare part usage, reduce LTR & SLTR

No	Machine	Controller Scope	Controller Type
1	Sheet Feeder	1 Sheet Feeder Controller	PLC
2	Yaskawa Robot SF	2 Robot General Controller 3 Robot CPU	PLC Robot CPU
3	Kawasaki Centering Robot	4 Robot General Controller 5 Robot CPU	PLC Robot CPU
4	Press Machine 1P	6 1P General Controller 7 Slide Controller 8 Cushion Controller	PLC CNC CNC
5	Press Machine 2P	9 2P General Controller 10 Slide Controller	PLC CNC
6	Press Machine 3P	11 3P General Controller 12 Slide Controller	PLC CNC
7	Press Machine 4P	13 4P General Controller 14 Slide Controller	PLC CNC
8	Nachi Robot #1	15 Total Handling Robot Integrator (ACP) 16 Robot General Controller 17 Robot CPU	PLC PLC Robot CPU
9	Nachi Robot #2	18 Robot General Controller 19 Robot CPU	PLC Robot CPU
10	Nachi Robot #3	20 Robot General Controller 21 Robot CPU	PLC Robot CPU
11	Nachi Robot #4	22 Robot General Controller 23 Robot CPU	PLC Robot CPU
12	Nachi Robot #5	24 Robot General Controller 25 Robot CPU	PLC Robot CPU
13	Kawasaki Idle Table Robot	26 Robot General Controller 27 Robot CPU	PLC Robot CPU
14	Yaskawa Robot 6R	28 Robot General Controller 29 Robot CPU	PLC Robot CPU
15	Yaskawa Robot 6L	30 Robot General Controller 31 Robot CPU	PLC Robot CPU
16	Manual Palletizer & LOP	32 MP Controller 33 Line Operation Controller	PLC PLC
17	Scrap Conveyor	34 Scrap Conveyor H	PLC
18	Crane 40T South	35 Crane Controller	Sequence MC/Relay



**Thank you**