MITSUBISHI ELECTRIC
Changes for the Better

e-F@ctory Case study

Quality Improvement

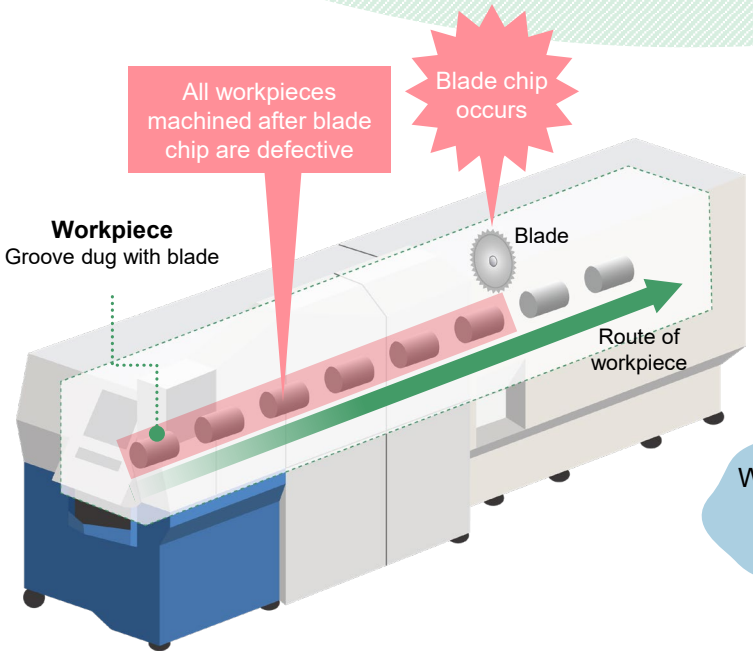
Machining Defects Reduced by 98% with Blade Chip Detection!

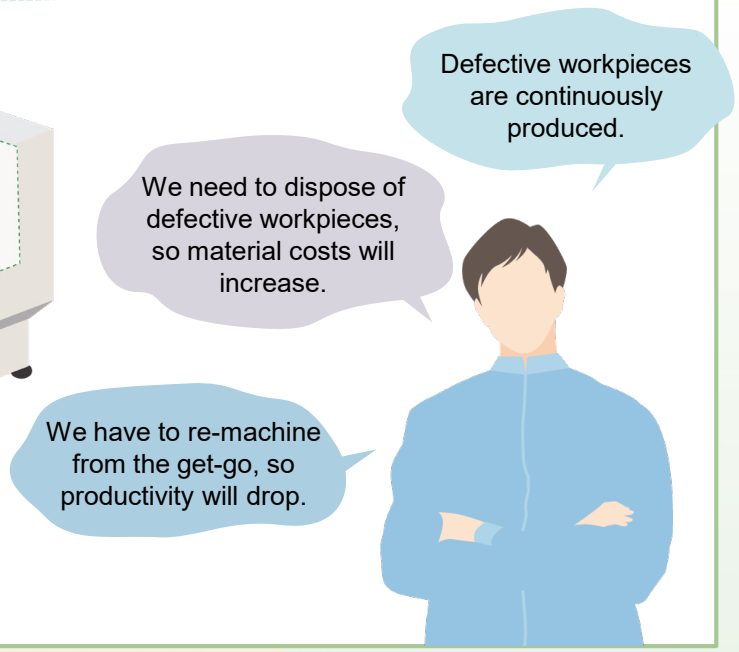
Company “A” was troubled with a high number of defective workpieces caused by blade chipping midway through machining. The company adopted a preventive maintenance system to detect such troubles, and succeeded in reducing 98% of defects caused by blade chipping.
What was the secret to its success?

See inside for details!

Customer's Concern

Pallets of 600 workpieces are batch machined automatically,
so if a blade chip occurs midway through machining,
all workpieces from that point onward would be defective.
It takes two minutes to machine each workpiece,
so there was also an issue of significant loss of machining time.





What has improved

The company introduced a preventive maintenance system that helps to immediately detect when blade has chipped during machining. Workers can stop the equipment at once, which lead to reducing the number of defective workpieces by approximately 98%, from 600 per month to 10 per month. Loss in machining time was also reduced by approximately 20 hours a month, thus improving productivity.

Defective workpieces caused by blade chips

Before

600 pieces/month
(Loss in machining time: Approx. 20 hours/month)

After

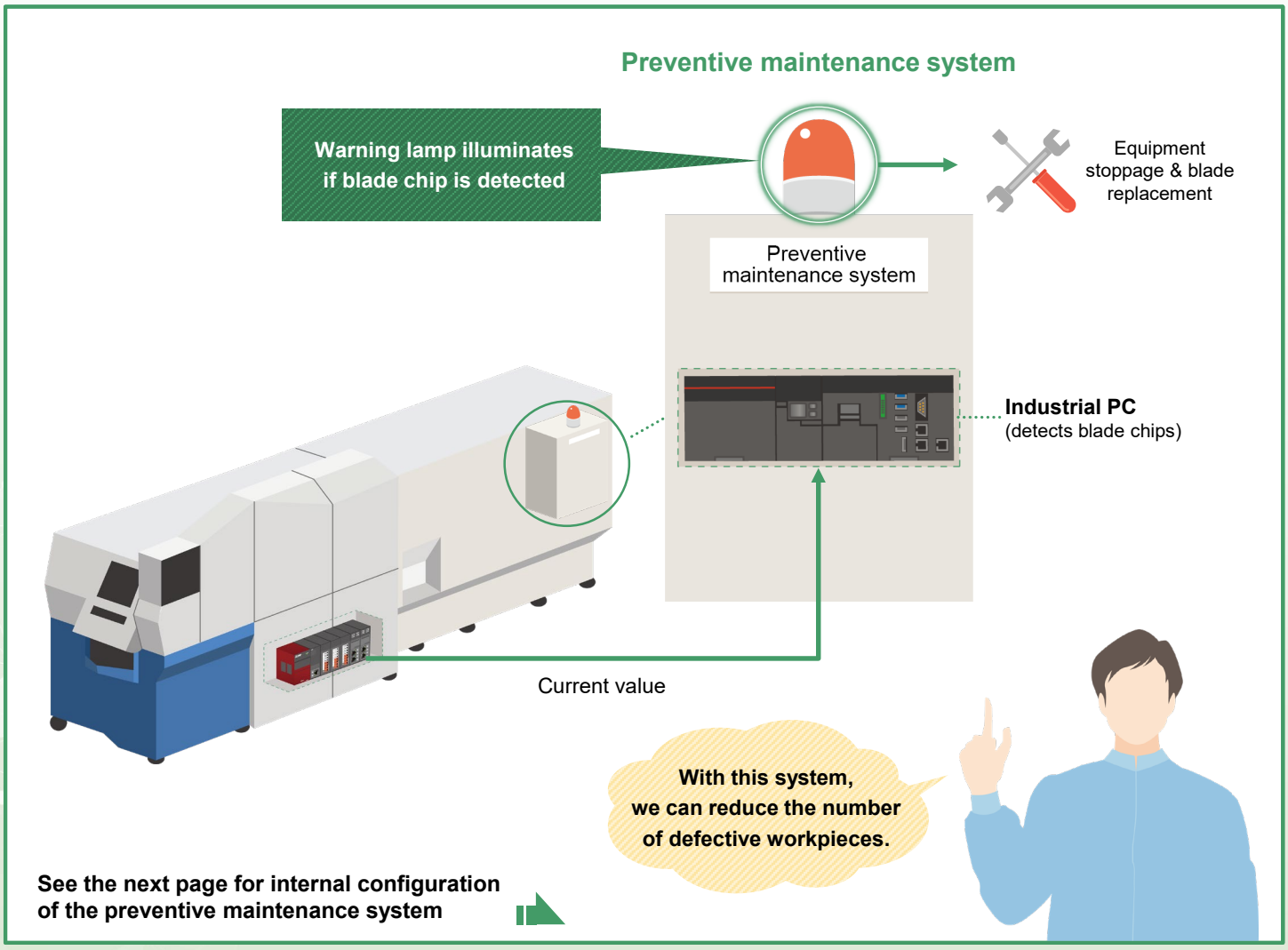
10 pieces/month
(Loss in machining time: Approx. 20 minutes/month)

Reduced by approx. 98%

e-Factory Key Points

Point 1 Blade chips are detected through real-time monitoring and diagnosis of the slightest differences in machining load.

Point 2 If a blade chip occurs, worker is promptly notified by a warning lamp or other alerts. The impact can be minimized by stopping the equipment immediately .



See the next page for internal configuration of the preventive maintenance system

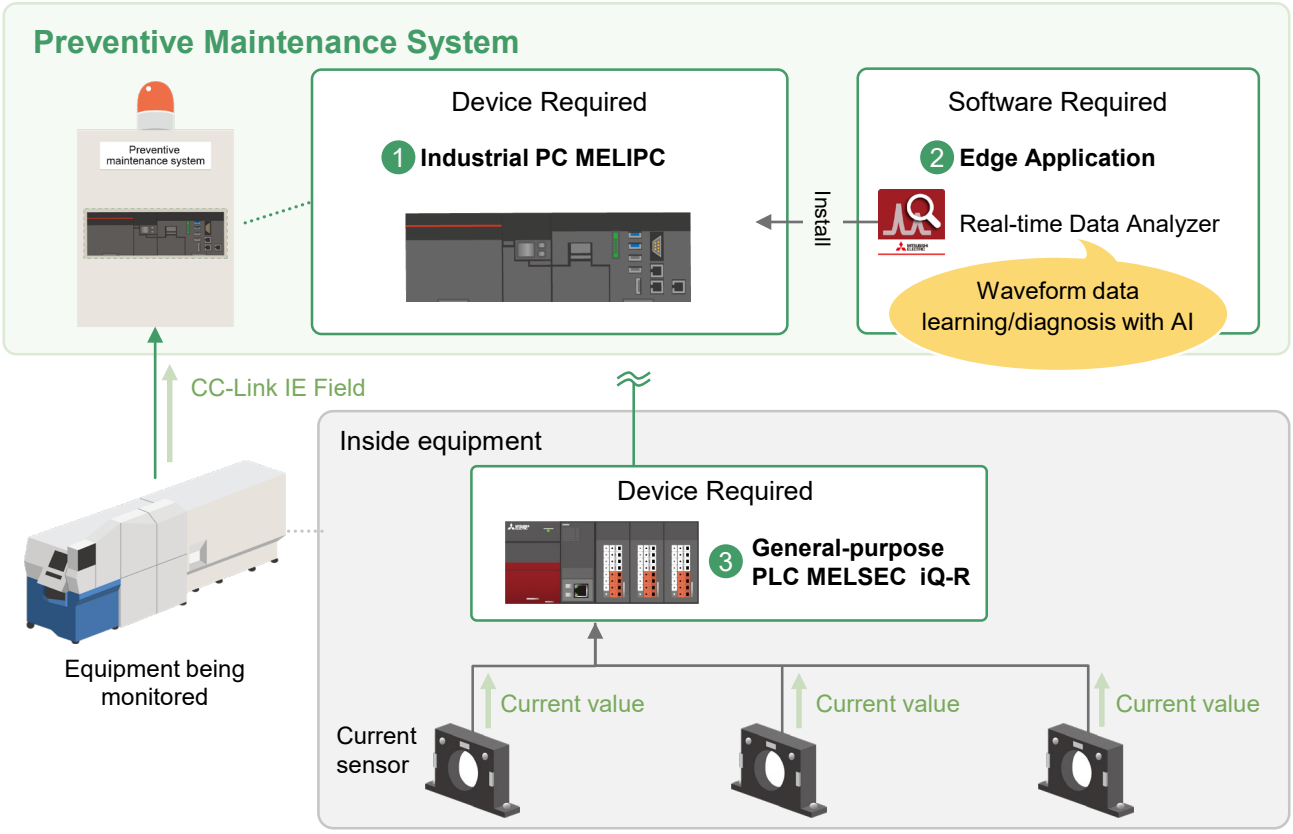
Return on investment (ROI)

Cost	Construction period	Payout period
Approx. **4.4** million yen /equipment (including system configuration)	**3** months	**1** Year **7** months

***Interpretation of payout period** If two blade chips occurred in a month, creating an average of 300 defective workpieces (with a material unit price of 500 yen) each time, the monthly loss cost would be 2 occurrences x 300 pieces x 500 yen = 300,000 yen. If the number of defective workpieces was reduced by 98% to 10, 300,000 yen – (10 pieces x 500 yen) = 295,000 yen could be retrieved per month. In the first year the system is introduced, the return on investment would be 295,000 yen × 12 months = 3.54 million yen. The remainder would be 4.4 million yen - 3.54 million yen = 860,000 yen. Running costs, however, amount to 1 million yen/year, so the payout period in the second year would be approximately seven months (860,000 yen + 1 million yen) ÷ 295,000 yen, thus the payout period would be 1 year and 7 months.

Overview of the Preventive Maintenance System

The preventive maintenance system introduced in this example is configured from industrial PC, **MELIPC**, and general-purpose PLC, **MELSEC iQ-R**. It achieves preventive maintenance by learning and diagnosis of waveform data with AI by utilizing **Real-time Data Analyzer**, an edge application provided by Mitsubishi Electric.



Equipment Configuration (example)

Type	Model	Overview	Standard price (yen)
1 Industrial PC MELIPC			
MELIPC Main Module	MI5122-VW	Industrial PC for executing edge applications	Open
2 Edge Application			
Real-time Data Analyzer	SW1DND-RDA-MQ12	Data analysis/diagnosis software that easily achieves preventive maintenance, etc. and improves quality of production lines.	1,000,000/year
3 General-purpose PLC MELSEC iQ-R			
PLC CPU	R04CPU	Collects current values from current sensors and sends data to industrial PC	120,000
Base Module	R33B	3 slots	20,000
Power Supply Module	R61P	Input: 100 to 240V AC Output: 5V 6.5A DC	20,000
Energy Measuring Module	RE81WH	Input module that receives current values from current sensors within equipment	70,000
CC-Link IE Field Module	RJ71GF11-T2	Network module that sends current values received to industrial PC at high frequency	50,000

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