MITSUBISHI ELECTRIC
Changes for the Better

e-F@ctory Case study

Preventive Maintenance

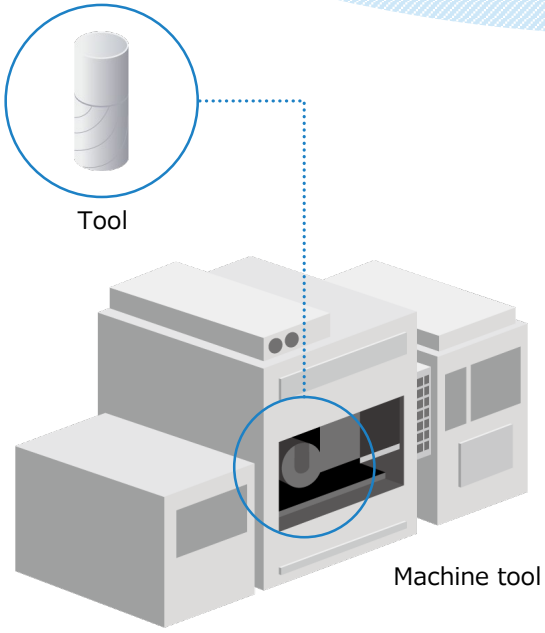
Machine Tool Costs Reduced by 40% with Tool Wear Diagnosis!

Company “A” used machine tools for only a certain number of times to machine workpieces. By introducing a tool wear diagnosis system, the company was able to reduce annual tool costs by 40%.
What was the secret to its success?

See inside for details!

Customer's Concern

Although the degree of tool wear differs depending on the workpiece, the company replaced tools after a certain number of times used, even though some tools could still be used. The company was also unable to inspect every workpiece, which lead to concerns of defective products being delivered to customers.



What has improved

Leveraging the Tool Wear Diagnosis System, the company can now forecast the lifespan of tools. By optimizing the frequency of tool replacements, tool cost has been cut down by approximately 40%, and there are also benefits from reduced work for tool replacements. Also, immediately after machining each workpiece, an inspection is carried out to identify any faults by comparing the state of the workpiece to those produced under normal machining conditions, thus preventing defective workpieces from being shipped.

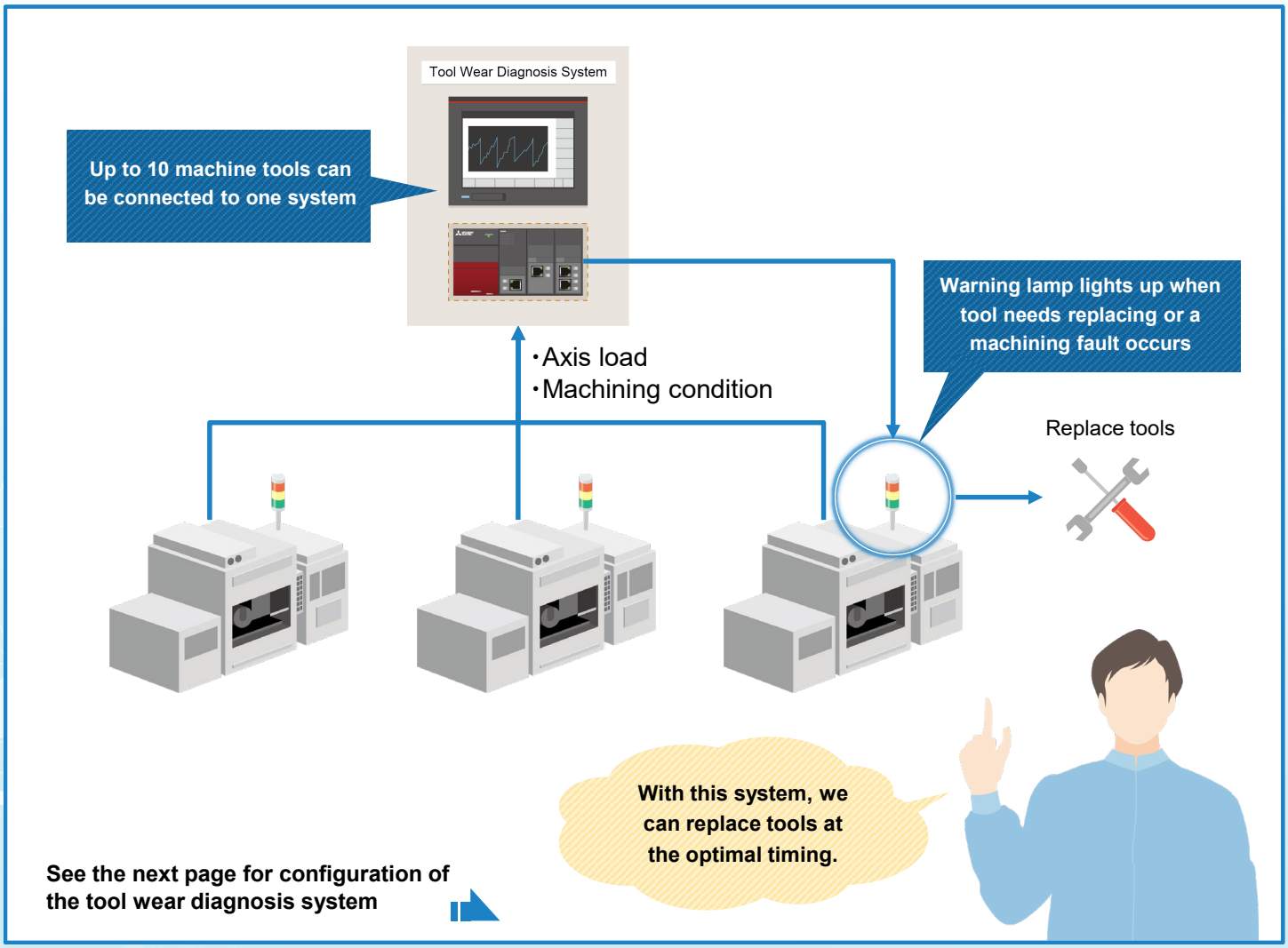
	Before	After
Tool cost	2.33 million yen/year (86 new tools, 174 reground tools)	1.38 million yen/year (51 new tools, 102 reground tools)

Reduced by approx. 40%

e-F@ctory Key Points

Point 1 The system provides forecasts of tool lifespan based on the fluctuation in axis load for each machining condition, and indicates the remaining number of times the tool can be used.

Point 2 When machining faults occur due to broken or damaged tools, the system instantly detects “something is wrong” by comparing with workpieces made under normal machining conditions.



See the next page for configuration of the tool wear diagnosis system

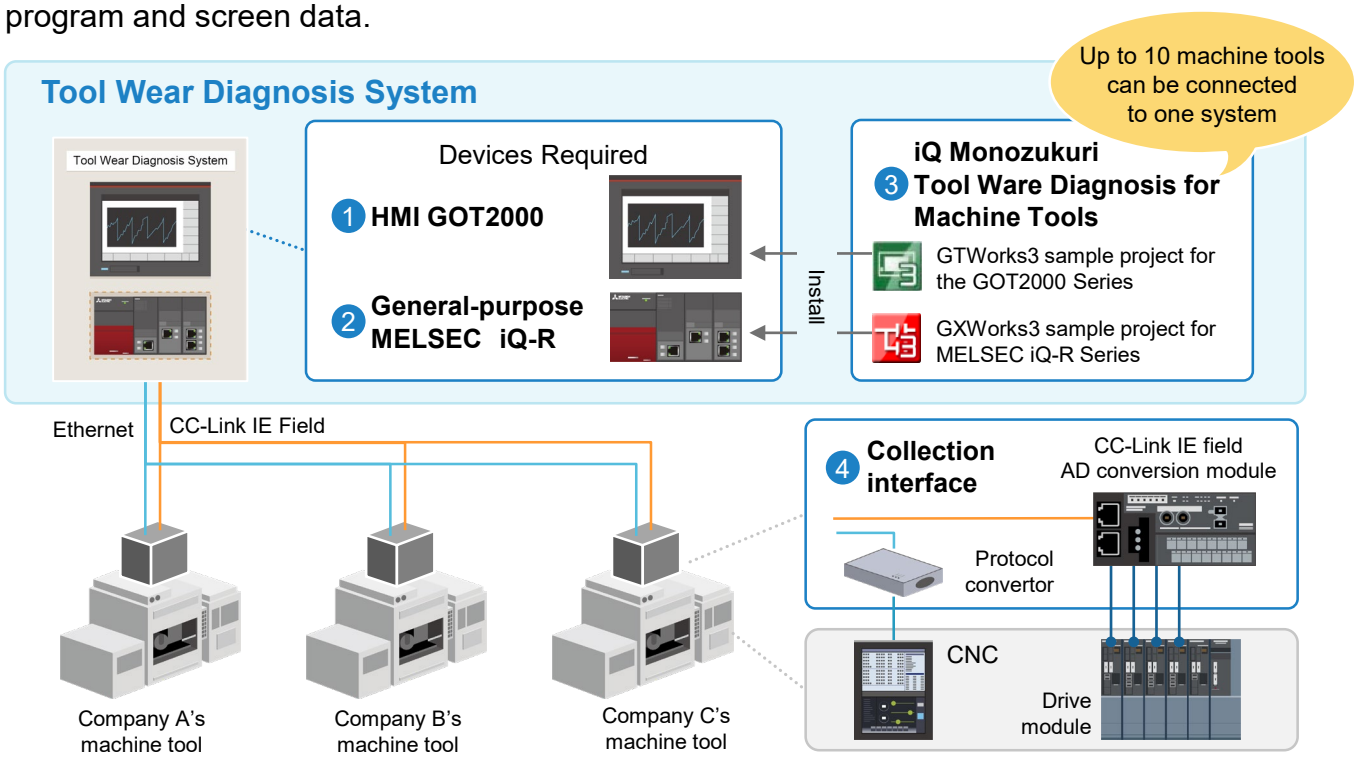
Return on investment (ROI)

Cost	Construction period	Payout period
Approx. 3 - 5 million yen /system (including system configuration costs)	Approx. 1.5 months	Approx. 1 year

*Interpretation of payout period For this case study, new tools cost 15,000 yen each, the cost of regrinding is 6,000 yen per tool, and conventionally, 86 new tools and 174 reground tools are used per piece of equipment. Therefore, the required annual tool cost was 86 tools x 15,000 yen + 174 tools x 6,000 yen = 2.33 million yen.
After introducing the Tool Wear Diagnosis System, the number of tools used became 51 new tools and 102 reground tools, therefore annual tool cost became 51 tools x 15,000 yen + 102 tools x 6,000 yen = 1.38 million yen.
The reduction in annual tool cost per equipment was 2.33 million yen – 1.38 million yen = 950,000 yen. If there are three machine tool units with a cost of 3 million yen, the payout period would be 3 million yen ÷(950,000 yen x 3 units) ≒ 1 year.

Overview of the Tool Wear Diagnosis System

The tool wear diagnosis system introduced in this example is configured from a general-purpose PLC, **MELSEC iQ-R**, and HMI, **GOT2000**, and can be easily introduced to a production line by connecting to existing machine tools and simply installing a control program and screen data.



Equipment Configuration (example)

Please prepare cables for connection to devices not listed below.

Type	Model	Overview	Standard price (yen)
1 HMI GOT2000			
GOT Main Module	GT2512-STBA	12.1inch SVGA [800×600] 65536 colors	360,000
SD Memory Card	NZ1MEM-4GBSD	For GOT	50,000
2 General-purpose PLC MELSEC iQ-R			
PLC CPU	R16CPU	Firmware version "40" or later	380,000
Extension SRAM Cassette	NZ2MC-16MBS	For PLC CPU	130,000
Base Module	R35B	5 slots	21,000
Power Module	R61P	Input: 100 to 240VAC Output: 5V 6.5A DC	20,000
High-Speed Data Logger Module	RD81DL96		180,000
SD Memory Card	NZ1MEM-4GBSD	For high-speed data logger module	50,000
CC-Link IE Field Module	RJ71GF11-T2		50,000
3 FA Application Package iQ Monozukuri Tool Ware Diagnosis for Machine Tools			
Tool Ware Diagnosis for Machine Tools	AP10-MTD001AA-MA	Up to ten machine tools can be connected per license	500,000
4 Collection Interface			
CC-Link IE Field AD Conversion Module	NZ2GF2BN-60AD4	A set of collection interface devices are required for each machine tool. The devices required depend on what kind of machine tool is used.	78,000
CC-Link IE Field Expansion AD Conversion Module	NZ2EX2B-60AD4		58,000
CC-Link IE Field Remote IO Module	NZ2GF2B1-32DT		56,000
Protocol Convertor（other company's product）	-		-

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