

# Cost of Ownership and Return on Investment Analysis of the Fabworx™ Robotic Arm, using Wright Williams & Kelly's TWO COOL® Modeling Software

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Determining the impact of Cost of Ownership (COO) and Return on Investment (ROI) is crucial in the high-tech decision-making process. To analyze the financial impact of upgrading an Applied Materials' Centura® System with a Fabworx Solutions HP Robotic Arm, a cost-of-ownership model was developed, and is described in this article. Using TWO COOL, the industry-standard software from Wright Williams & Kelly, a comprehensive return on investment model was generated for several tool performance areas, using actual data provided by customers.

## OVERVIEW

A number of AMAT Centura systems were upgraded with the Fabworx Robot. These upgrades were performed to improve a variety of issues, including reliability, throughput and yield. The financial impact of these upgrades was analyzed collaboratively by both Fabworx Solutions and Wright Williams & Kelly.

WWK's TWO COOL cost-of-ownership analysis software was used to evaluate the ROI and payback interval of these Fabworx robot upgrades. Incorporating full SEMI Standards compliance for analyzing COO and OEE, TWO COOL is accepted as the industry standard and is widely used by major semiconductor manufacturers and equipment suppliers.

Using this software application, a model was generated that incorporates customer-supplied data taken before and after the upgrades were performed. This customer data was collected from several upgrades throughout multiple fabs over a period of twelve months.

This article provides details on the model used, the results obtained, the Fabworx Robot and the TWO COOL software application. Additional information can be provided by contacting either Fabworx Solutions ([www.fabworx.com](http://www.fabworx.com)) or Wright Williams & Kelly ([www.wwk.com](http://www.wwk.com)).

## RESULTS

The results of this analysis indicate that the Fabworx Robot upgrade provides substantial return on investment. This return is obtained within several performance improvement areas that were independently measured and analyzed:

- Reliability is improved, providing a cost savings on replacement parts, labor and tool downtime.
- Wafer placement repeatability is improved, reducing backside pressure faults and thus increasing tool availability.
- Tool throughput is increased, effectively providing incremental capacity.
- Wafer scratching due to robotic inaccuracies is eliminated, resulting in an immediate yield increase.
- Wafer-handling-induced particles, another source of yield loss, are greatly reduced.

Considerable payback is achieved in each area. As expected, tool improvements that impact yield provide the greatest payback, while maintenance items provide the least. Details on each of these improvement areas are described on the following pages.

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## Summary

Five performance areas were examined during this analysis, in which OEM issues and potential improvements to each were reviewed. WWK's TWO COOL software application was used to determine the financial implications of the design enhancements provided via the Fabworx upgrade. Both COO and ROI were modeled using before-and-after data supplied by customers. To remain conservative in the modeling calculations, a lesser improvement than what was actually achieved was used to determine ROI.

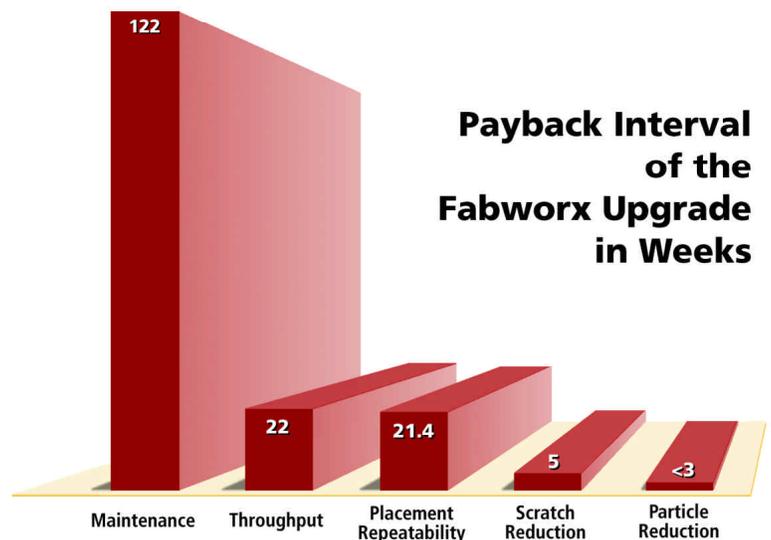
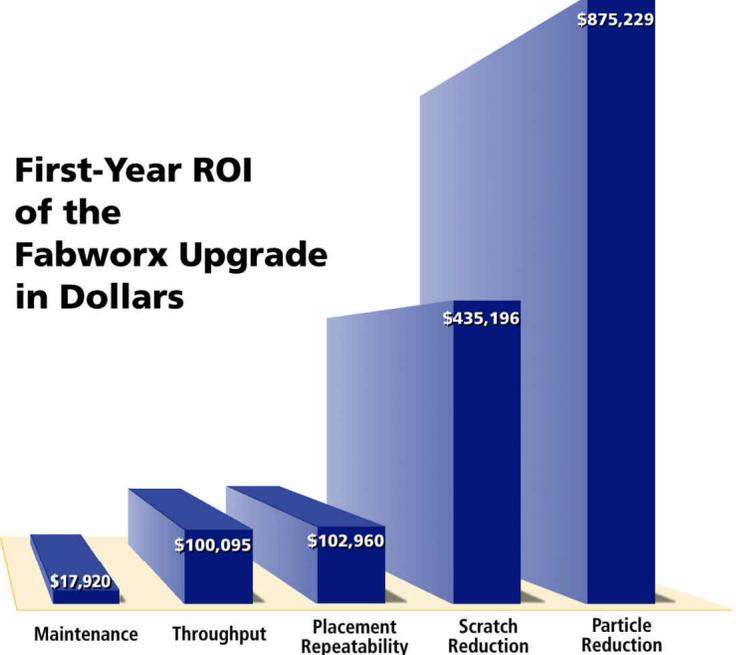
The TWO COOL software proved highly effective at providing the information of interest. The software was easy to use, was exceptionally flexible, and had the capabilities required to analyze the financial implications of this robot upgrade.

The Fabworx Solutions Robot demonstrated considerable financial benefit to those customers who provided the data used in this model. Several improvements were evident in the Centura and Endura tools as a result of the Fabworx upgrade. All areas demonstrated a strong return on investment.

The five performance areas that were modeled are summarized on the right side of this page.

- As expected, improvements made to the tool for basic parts reliability reasons (i.e., bearing replacements) have a moderate ROI, with a payback period of over two years.
- Improvements in tool productivity, allowing higher throughput or more uptime, have a much better ROI and a payback period of roughly six months.
- Scratches and particles impacted yield the most. The associated payback from these improvements is extremely large. The one-year return is 10 to 20 times the investment, and payback occurs in a few weeks.

Given the current industry financial pressures, the ability to analyze in detail the benefit of both tool and tool upgrade purchases is exceptionally valuable. Smart deployment of limited capital is a must. WWK software helps fabs make these difficult decisions. The Fabworx Solutions Robot helps fabs achieve the best performance possible from their existing equipment. Return on investment of these upgrades is substantial.



## **ABOUT FABWORX SOLUTIONS**

Fabworx Solutions, Inc. designs and manufactures upgrades for semiconductor manufacturing equipment. Their flagship series of products focuses on mechanical robot arm upgrades for HP and VHP robots on both Endura and Centura platforms. Other products include End Effectors and Wafer Handler Picks for a variety of other semiconductor manufacturing tools. Design features dramatically improve reliability, contamination control, repeatability and throughput of these systems. Headquartered in New Hampshire, Fabworx Solutions products are installed in leading fabs throughout the world. Information can be found on the web at [fabworx.com](http://fabworx.com), or by phone at 603.938.5658.

## **ABOUT WRIGHT WILLIAMS & KELLY**

Wright Williams & Kelly, Inc. (WWK) is a global supplier of decision tools for productivity and cost management. The company develops and markets commercial software products and is a leading expert and worldwide consultant for cost of ownership, process costing and factory simulation for the semiconductor, flat panel display, record head, magnetic media, solar panel and other high technology manufacturing industries. WWK also provides expert strategic and market based consulting services to technology-driven and technology-dependent organizations. Founded in 1991, WWK has proven it has the staying power to weather the cyclical nature of high tech manufacturing. WWK can be found on the web at [wwk.com](http://wwk.com), or by phone at 925-399-6246.