

Applied Design Research of the Operator-Machine Interaction of ASML's Extreme Ultraviolet Lithography Systems

Project Purpose

The purpose of this project is to conduct an applied human factors engineering research on the operator interface unit to reimagine the human-machine interaction of EUV lithography machines.

User Research

The user research consists of interviews, observations, a survey, task analysis and incident report analysis. It highlights that the main OIU user groups are install engineers, field service engineers, upgrade engineers, and customer operators. The main differences between the user groups are that, from a machine perspective, the ASML users have infrequent, but long OIU-related use scenarios, and customer operators have more frequent, short OIU-related use scenarios. The OIU use environment changes according to the type of user, the workspace around the OIU can be limiting, and the cleanroom can be a stressful environment to work in. Finally, results show that the majority of the users feel physical discomfort when using the OIU after a relatively short use duration.

Design Analysis

The design analysis presents a selection of key results that each impact the selection of the following set of design criteria for the future human-machine interaction:

- Provide textual & pointing input
- Space for input tools
- Provide visual output
- Optimize work posture
- Use all around machine
- Mobile device workflow
- Keep pathways clear
- Quickly accessible
- ASML aesthetics

Design Development

The outcomes of the user research and the design analysis are developed into a design proposal by conducting research into technology advancements, adjacent industries, organizing brainstorm and co-creation sessions, and finally developing and choosing one concept to proceed with.

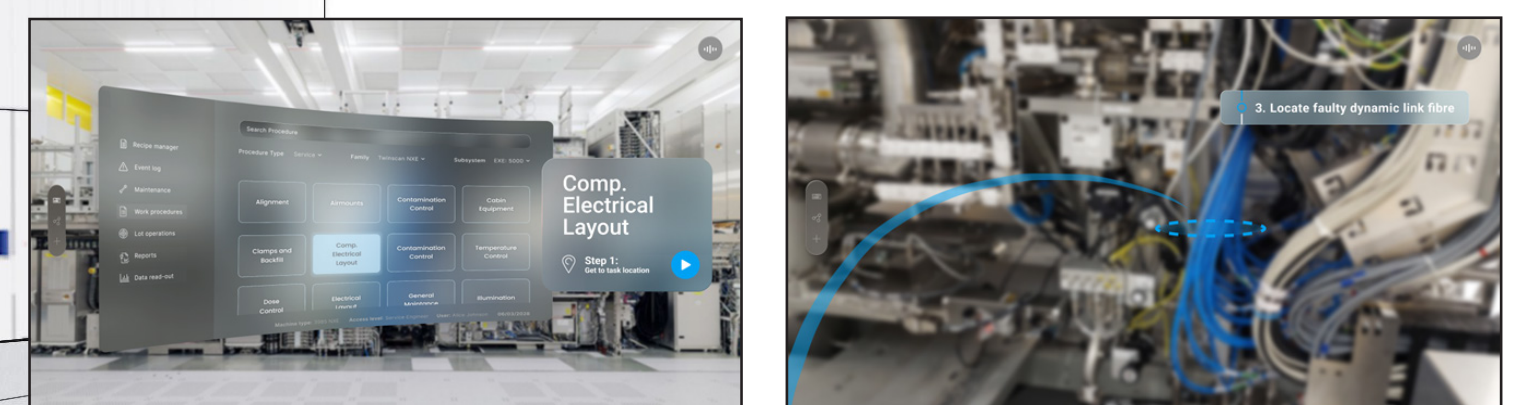
Design Proposal

The proposal is a system applying AR headsets, control room advancements, and a new platform. It allows the OIU to be removed from the machine and allocating new employee tasks to enhance efficiency. AR headsets enable the engineer to access the machine directly, have real-time work procedures, hands-free gesture and voice control, and improved collaboration. The AR headsets and adapted user interface allow the user to access and execute software actions during hardware tasks in the cleanroom. Additionally, longer, software-related actions can effectively be performed from the control room. This new approach improves the employee work conditions, minimizes cleanroom presence, improves work efficiency, accuracy and safety.

Envisioned Use Scenario



AR Interface Impression



Recommendations

The design proposal is a future vision and is expected to take about 10 years before fully developed. However, due to the urgent conclusions regarding current physical discomfort, it is recommended to pilot a short-term mobile workspace solution in addition to initiating research of the long-term vision.

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Integrated Product Design

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