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AI/ML Powered Solutions for Accelerating Performance and Productivity in Semiconductor Manufacturing

PDF Solutions
2025 Users Group Conference

March 2025

Lavorro Overview

Semiconductor Manufacturing Challenges

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"Highly valued engineers remain bogged down in manual, time consuming fabrication and assembly activities that have the potential to be significantly heightened through automation". **Accenture**

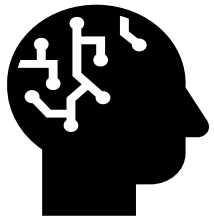
Deloitte predicts that more than ***1 million additional skilled workers will be needed by 2030***

"We are definitely in a war for talent," said Jim Koonmen, executive vice president at **ASML** NV

"Complexity of the tools and volumes of data are increasing exponentially requiring solutions to address tool uptime" said Anton DeVilliers, vice president and fellow at **TEL**

Autonomous Fab, Workforce Efficiency, Tool Uptime Challenges in Semiconductor

Lavorro: Solving Major Semiconductor Challenges



Increasing workforce requiring rapid skill-up (Greenfield, Expansion, Steady State)

Virtual Assistant “Lucy”

Increasing cost and complexity of tools with uptime challenges (while generating Terabytes of valuable data)

ToolAssist.ai™

Increasing siloed solutions in the Fab leading to longer issue resolution and loss of expert knowledge

FabAssist.ai™

Lavorro's Uniqueness and Expertise

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End-to-End Knowledge Augmented Generative AI Semiconductor Manufacturing Solutions

- Data Connection and Contextualization
- Knowledge Workbench
- Rapid AI/ML Application and Data Authoring
- Automation of Engineering Activities
- Virtual Assistant with Decision Support and Automation

Competitive Strength

Unique Solution in the Industry

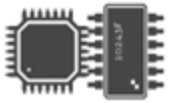
Market Leading Technology Incorporating Generative AI

Specialized in Semiconductor Manufacturing Data

Light Weight and Easily Deployable on Premise or on Cloud

Fast ROI

Deep Horizontal and Vertical Expertise in Technology and Manufacturing Domain



Semiconductor Equipment and Manufacturing

Semiconductor Data and Systems

Machine Learning, NLP, and Generative AI

Big Data Pipelining and Scaling

Knowledge and Content Management Systems

Lavorro Product Overview

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Fab and Tools

exensio Maestria™
PDF Solutions


Semiconductor Fab Data


All Tool Types
Etch, Dep, Litho, Coat, …

Tool Operations Printed/ Recorded Training & Maintenance Material

Lavorro Connectivity and Platform

PDF Solutions Connectors

Fab Data Connectors

cimetrix by PDF/SOLUTIONS
Sapience®

Log Data Connection Network to Lavorro

Lavorro Content Manager

lavorro FabAssist.ai™ and ToolAssist.ai™

Data Analytics Foundation

Time-series, Discoverable, Relational Data Lake with rich Machine-Learning authoring engine

Dynamic Content Foundation

Data Visualization

Authored Content Foundation

Auto-growing BKM & Query response

Knowledge & Learning Repository

Troubleshooting content (debug)

White Labeled Browser-based User Interface

GenAI Virtual Assistant

Private, browser-based interface with Generative AI for Chat, Search, and Workflow Automation

Users

Engineers

PDF Solutions and Lavorro Combined Offering

PDF Solutions with Fab Wide Virtual Assistant

exensio Maestria™

Fab Wide Virtual Assistant Add-On package for Exensio® and Maestria™

Features

- Virtual Assistant enables knowledge assisted root cause analysis, resolution, decision support / automation
- Curate, Synthesize, Operationalize data from Exensio® / Maestria™ with static data in fab (manuals, reports, SOPs, etc…) to implement actionable insights through PDF Solutions

Use Cases

- Ask Virtual Assistant on root cause and resolution for FDC/SPC faults based on manuals, engineering reports, SOPs, etc…
- Use Knowledge Workbench to resolve new FDC/SPC faults
- Automate for accurate OCAP action with root cause and resolution
- Extend usage to other issues (i.e. Yield, Defect, Test, etc…)

Benefits

- **Up to 50% increase in engineering efficiency**
- **Up to 10% decrease in MTTR**
- **Increase OFE (Overall Factory Efficiency) by expanding usage fab-wide**

High Level Solution Architecture

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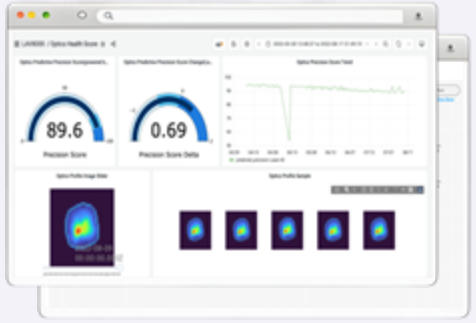
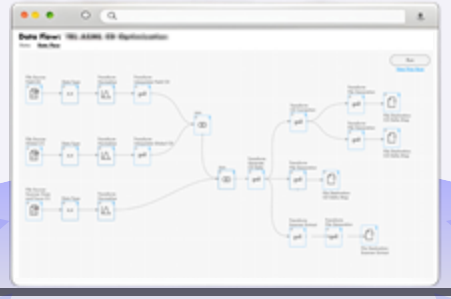
Knowledge Discoverer

Rapid Application Developer & Data Flow Authoring



Knowledge Augmentation Workbench



Data Connector & Contextualizer

On-Premise

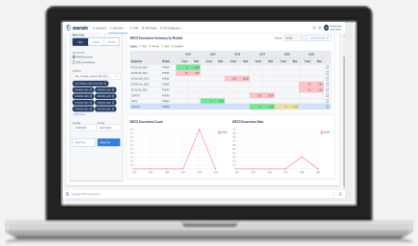
Cloud

AdHoc access to data stores (no data storage duplication required)

Knowledge Store		PDF Exensio®	PDF Exensio®		Operations	
SOP Store	Manual Store	SPC	FDC	APC	RTD	RTS
E-mail System	Training Store	DMS	OEE		EC	MES
Engineering Report Store		YMS	Interlock / OCAP		AMHS	CMMS

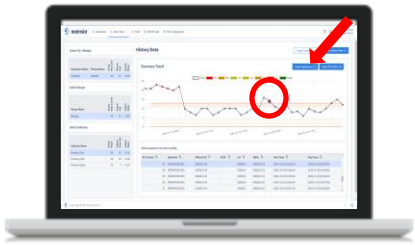
Use Case #1: Rapid FDC/SPC Fault Resolution

Fault detected in **Exensio® or Maestria™**

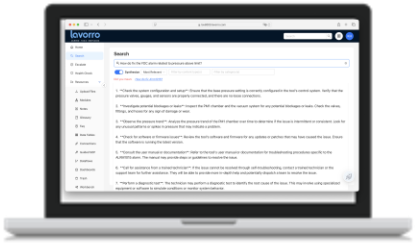


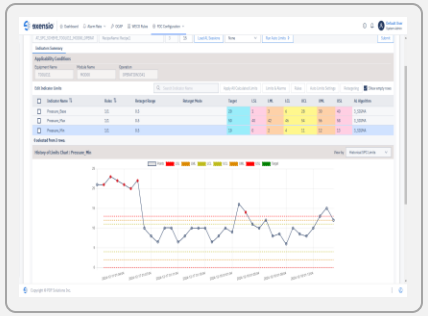
I see FDC/SPC fault in dashboard

Select the FDC/SPC fault of interest and ask Virtual Assistant



Virtual Assistant provides recommendations on the possible resolution for the fault





Feedback to **Exensio® or Maestria™**

Optionally, able to trigger maintenance workorder if maintenance required as part of the resolution

Also, provide Knowledge Workbench to allow for additional analysis and expert knowledge capture especially for new faults

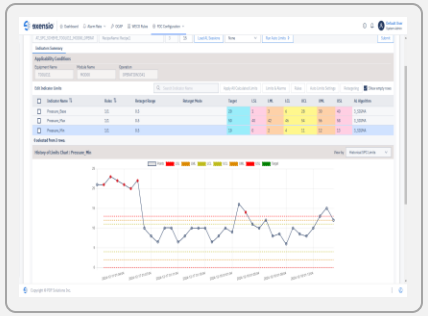
Use Case #2: Real-Time Auto Recommendation

Fault detected in **Exensio® or Maestria™**

Recommend Resolution and Action

Notified and Click

Engineer Decide



Feedback to **Exensio® or Maestria™**

Trigger Maintenance

Capture Knowledge

PDF Solutions and Lavorro

★★★★★ Combining Industry leading solutions from PDF and Lavorro to Augment and Operationalize knowledge

 Capture and Share Knowledge of Experts

 Improve Workforce Efficiency and decrease MTTR with FabAssist.ai™ and Exensio®

 Path to Autonomous decision based on historical recommendations / actions and continuous learning

Thank You