
A d v a n c e d M a s k T e c h n o l o g y C e n t e r , D r e s d e n

Handling Activities on (EUV) Masks

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EUV Mask Handling Workshop, 1 November 2004, Miyazaki (Japan)

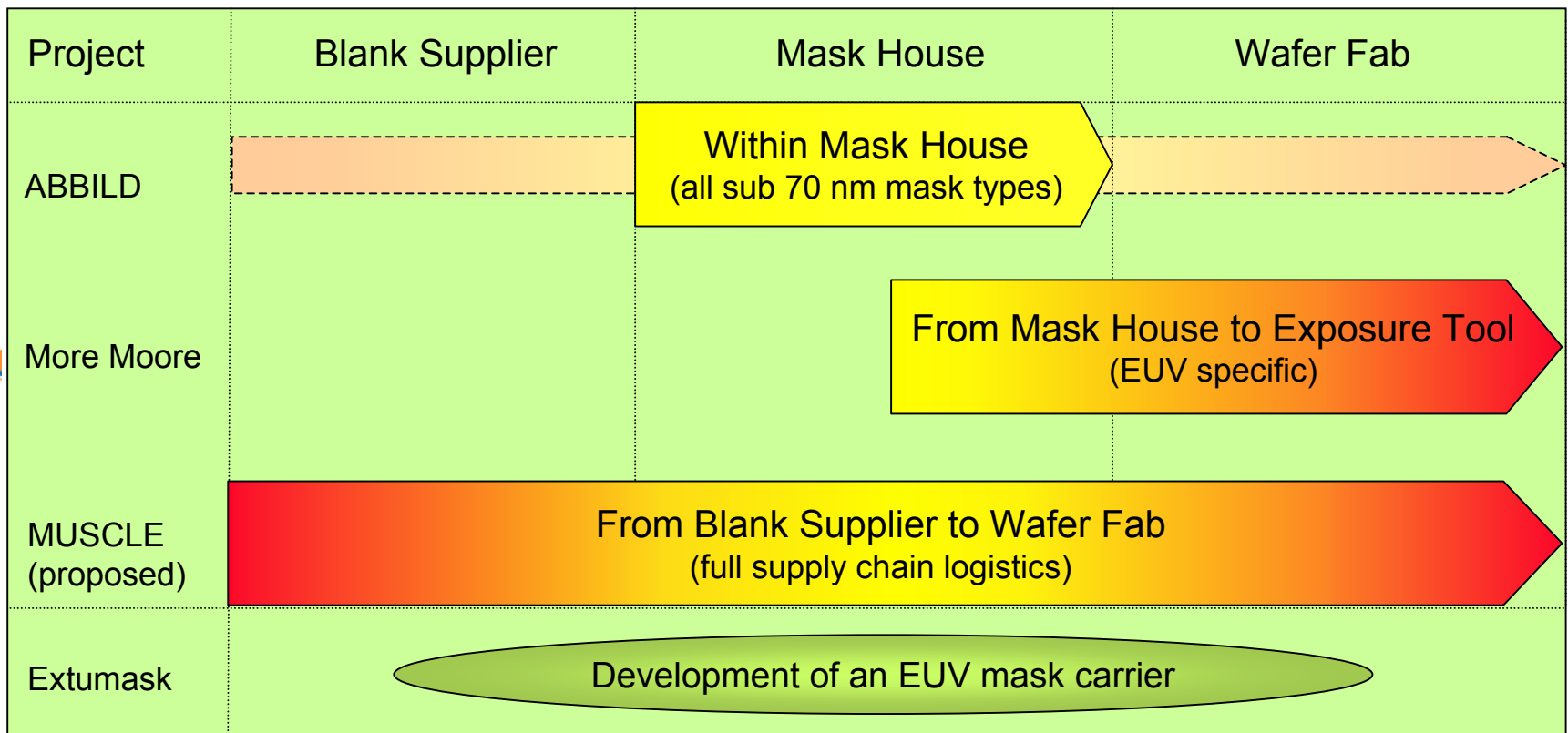
Handling Definition

- Handling during the production process
 - Mask blank production → identification and defect control
 - Mask structuring process → defect and contamination control

- Handling during the transportation along the supply chain
 - Identification and data exchange
 - Preservation of mask physical and optical properties

- Handling during the usage cycle
 - Within the wafer fab → identification and contamination control
 - Within the exposure tool → effective usage time

Mask Handling Activities in European Projects



German Project ABBILD



- Project for mask processes 193, 193i and EUV, sub 90nm wafer lithography and projection mask less lithography

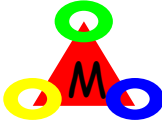
Handling aspects covered

- Integrated handling concepts within mask house, e.g.
 - consistent use of mini environments with SMIF technology
- Handling across the supply chain

Handling aspects of ABBILD will be reported to MUSCLE



MUSCLE



Proposed MEDEA+ project for mask user supply chain for advanced masks

- Data flow
- Material flow
- Feedback flow



Standardization

Proposed by

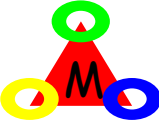
- European based semiconductor companies
- European based mask houses
- European tool and blank suppliers
- Software companies
- Public research institutions



Proposed start

- Jan 2005



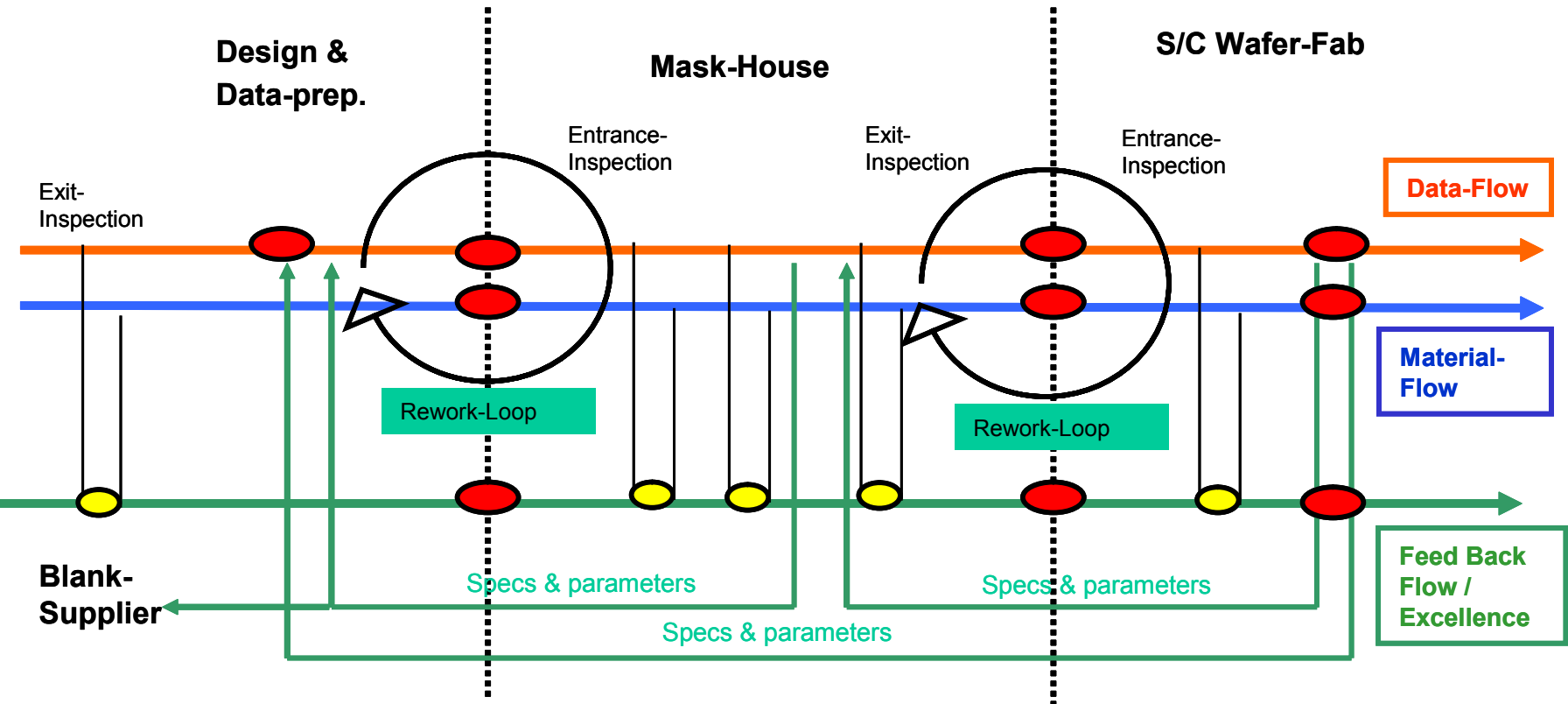


MUSCLE

Design & Data-prep.

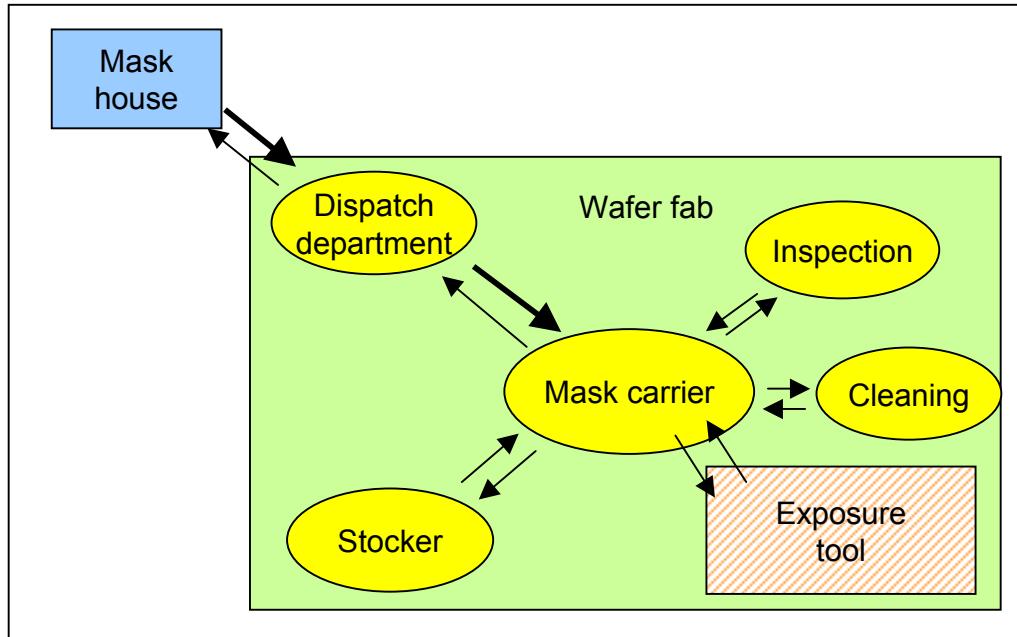
Mask-House

S/C Wafer-Fab

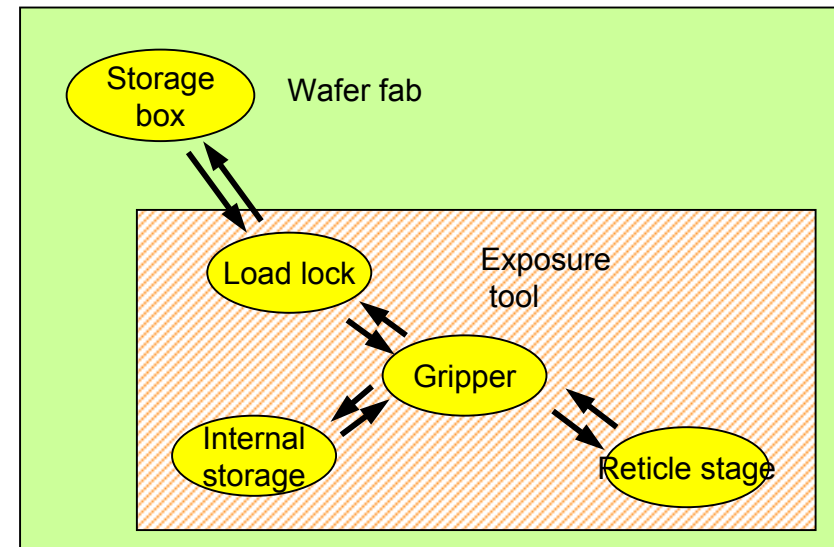


FLOW INTERRUPTION / OPPORTUNITIES

Within European Project "more Moore"



Understanding the issues for handling of masks in the fab and in the exposure tool



Understanding Current Situation: Transport Boxes

- Base principal: learn from wafer fab experience
 - SMIF obsolete for wafers since 300 mm → FOUP
 - Mini environment and SMIF technology for reticles present in 300 mm fabs

Currently SMIF technology is in introduction in mask houses
(encapsulation of processes)
→ already established at AMTC

BUT: is SMIF good enough for EUV??



More difficult material flow already in preparation of EUV

What effect does this have on transport box ?

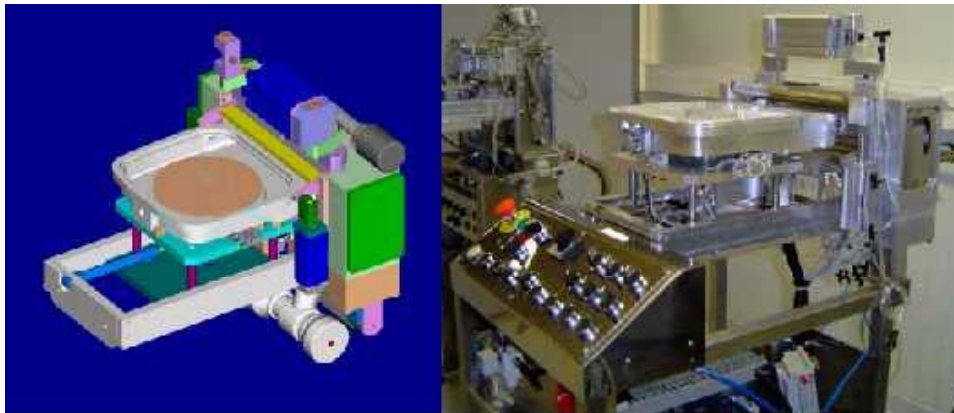
- SMIF evolution or FOUP revolution ?
 - SMIF → transport / handling area and opening interface identical
 - FOUP → transport / handling area and opening interface separate

EXTUMASK



Work package – EUV carrier

- Simulation of a nitrogen or vacuum carrier concept
- Front end loading port design for
 - minimized contamination
 - Inclusion of additional objects like thermophoresis protection or micro-pumps
- First prototype under functional tests



Additional Topics to Look at

EUV is a vacuum exposure technology

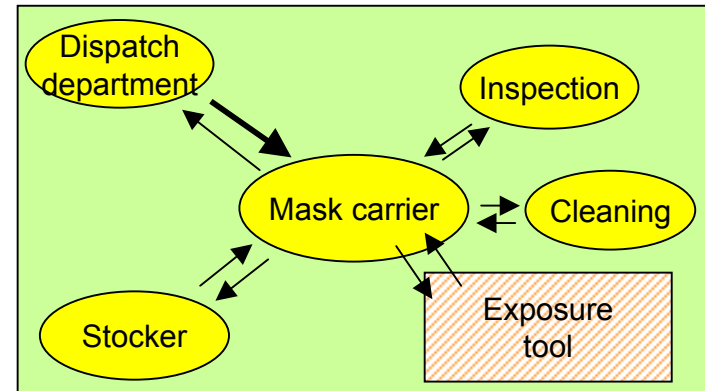
- But starting when is vacuum necessary?

Usable mask lifetime in exposure tool

- Check → mask still efficient for exposure?
- MTBI – mean time between inspections
- Is in-situ metrology required ?
- Is in-situ cleaning necessary, feasible ?
→ or better outside the tool ?

Cleaning methods

- Particles
 - Contaminations
 - Avoid ESD damages
- Cleaning principles become more important

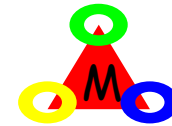


Understanding Future Situation: Data Issues

- Identification of individual mask
 - Keep for lifetime of mask
 - Link to data system for processing
 - Link to carrier

- Mask history tracking system
 - Still so many different stack options
 - Different treatment throughout the chain
 - Data hard to compare

- Information flow between supply chain partners
 - Required data fields
 - Method of exchange



Conclusions

- Up to now more or less only individual approaches for EUV
- First integrated processes and upcoming full field tools
 - require transport and handling concepts along supply chain
- International standardization needed for supply chain topics
 - Requirement specifications → MUSCLE, more Moore
 - International input more than welcome

Acknowledgements

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... and highly appreciates the possibilities for joint projects within MEDEA+ within

■ EXTUMASK

■ MUSCLE

