Cost-Down needed to enable ASML / Customer roadmap

Bridging the GAP between design and manufacturing

Jeroen Aerts, Goof Pruijsen
System Engineering, Value Engineering

Veldhoven

VERSION 1

Outline

1. How ASML enables the exponential growth of computing
2. The cost-challenges of ASML
3. The knowledge GAP between Design and Manufacturing
4. How can we help each-other

Jeroen Aerts
ASML High-NA Cost System Engineer
Value Engineer

Goof Pruijsen
ASML Value Engineer Competence Lead

The Cost-Challenge captured in one Quote;

"It's not responsible to move to the next product without understanding the cost and complexity constraints we have to put on those products from the very beginning".

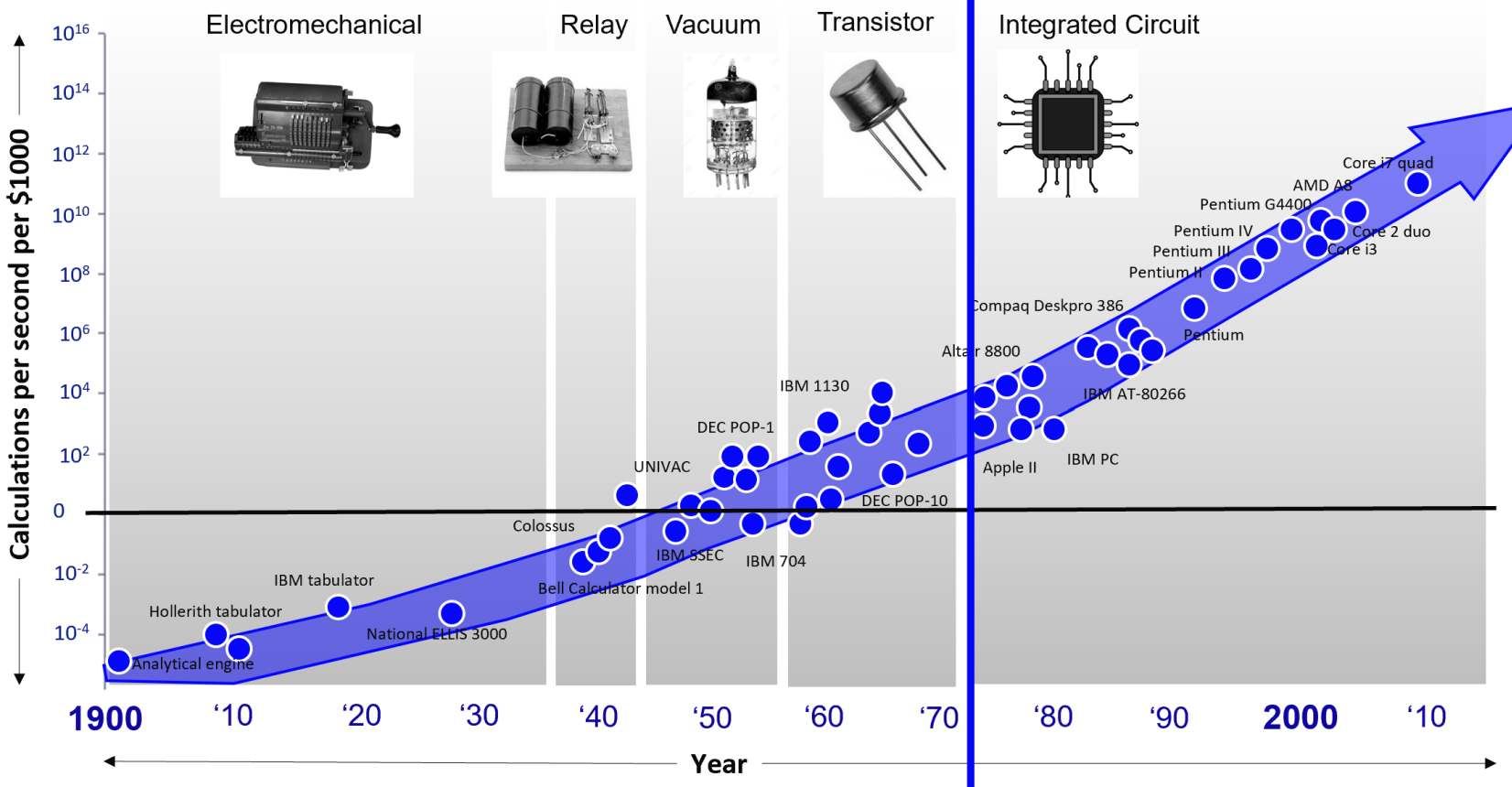
~Van den Brink [ASML CTO] Bits & Chips Feb'23

1. Getting grip on cost needed to secure ASML / Customer roadmap
2. Potential knowledge gap between design and real-world (e.g., manufacturing)
3. Cost mostly influenced in early design phase (years ahead)

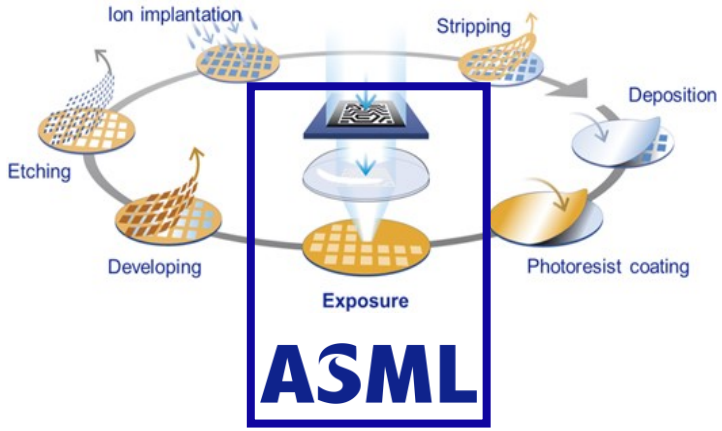
How ASML enables the exponential growth of computing

ASML Lithography and measurement solutions play an integral role in microchip manufacturing

Exponential Growth of Computing[1]



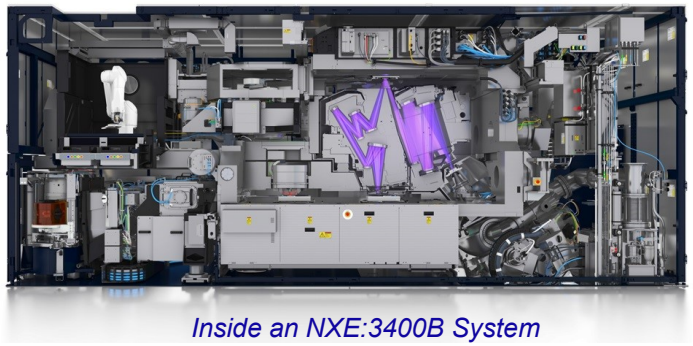
Microchip manufacturing process[2]



The Rayleigh Criterion

Determines just how small the features on a chip can be printed

$$CD = k_1 \frac{\lambda}{NA}$$

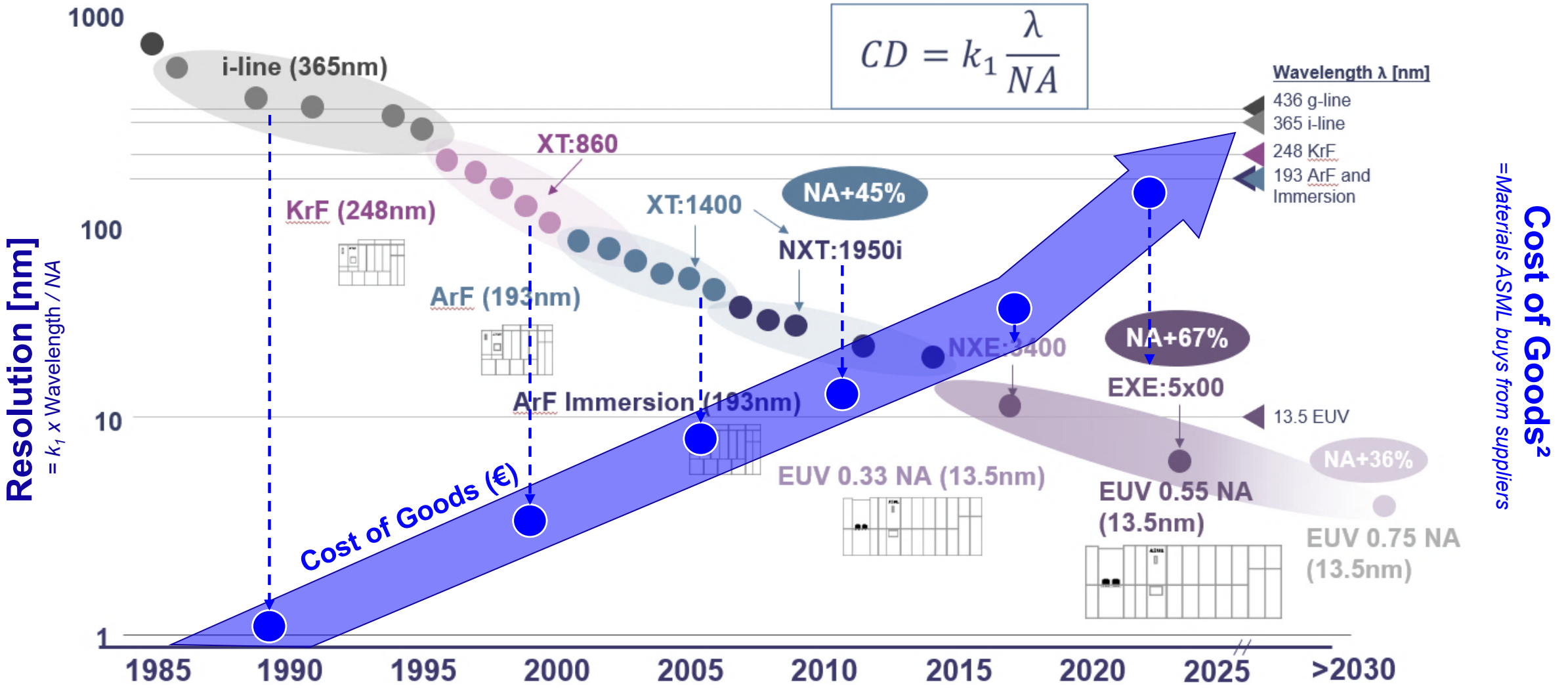


Inside an NXE:3400B System

1. *Raymond Kurzweil: Moore's Law the Fifth Paradigm*
2. *Annual Report 2019, Annual Report 2023*

High-NA boosts Cost of Goods increase to >2 orders of magnitude[1]

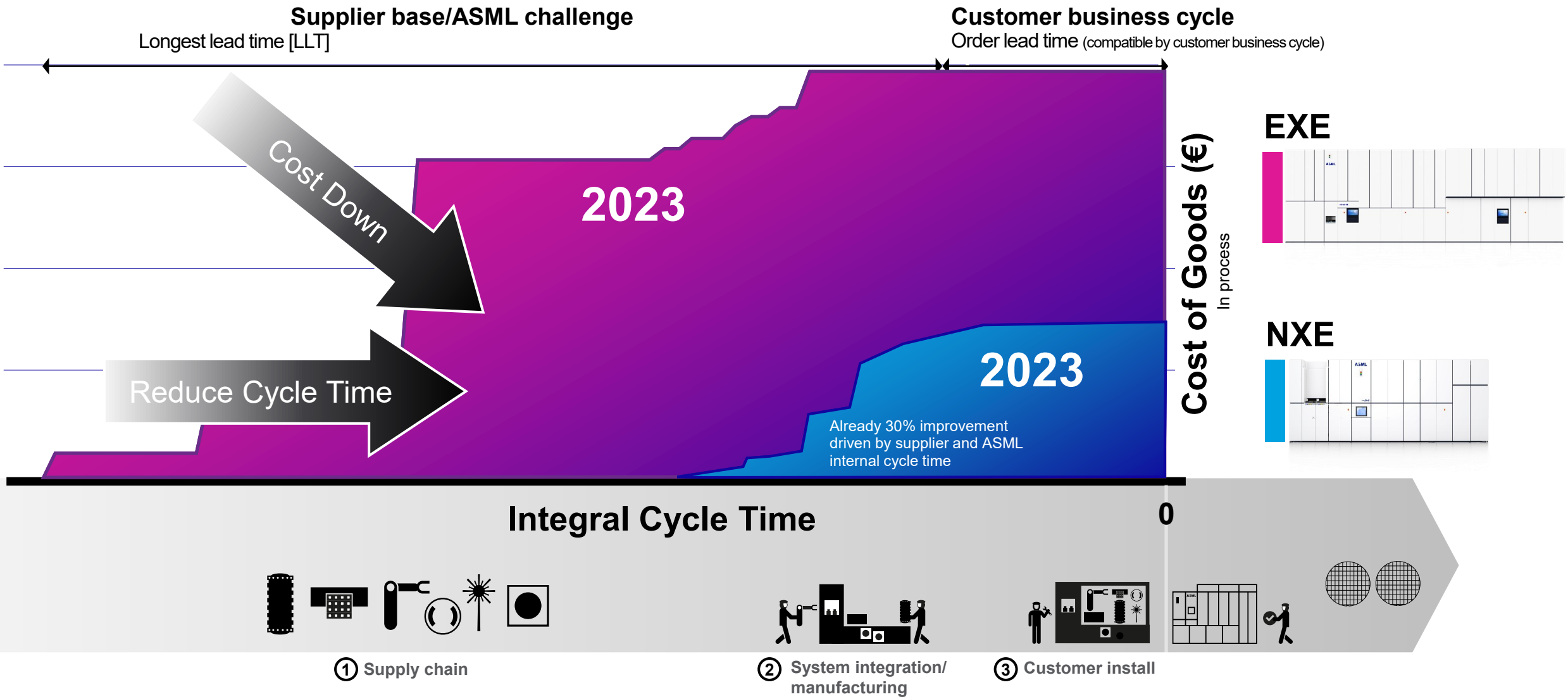
Whereas improvements on Wavelength, Numerical Aperture, Illumination (k_1) has enabled >2 orders of magnitude resolution* reduction in 35 years, the Cost of Goods (€) to of these Litho-Tools has also increased with >2 orders of magnitude.



1. *Slides as presented by Van den Brink during Tech Conference 2023 adapted to visualize Cost-of-Goods development over time.*
2. *Resolution [nm] does not consider actual productivity at customer making it unclear how the Cost-per-Die relates to the Cost of Goods*

Faster and more cost-efficient innovation needed

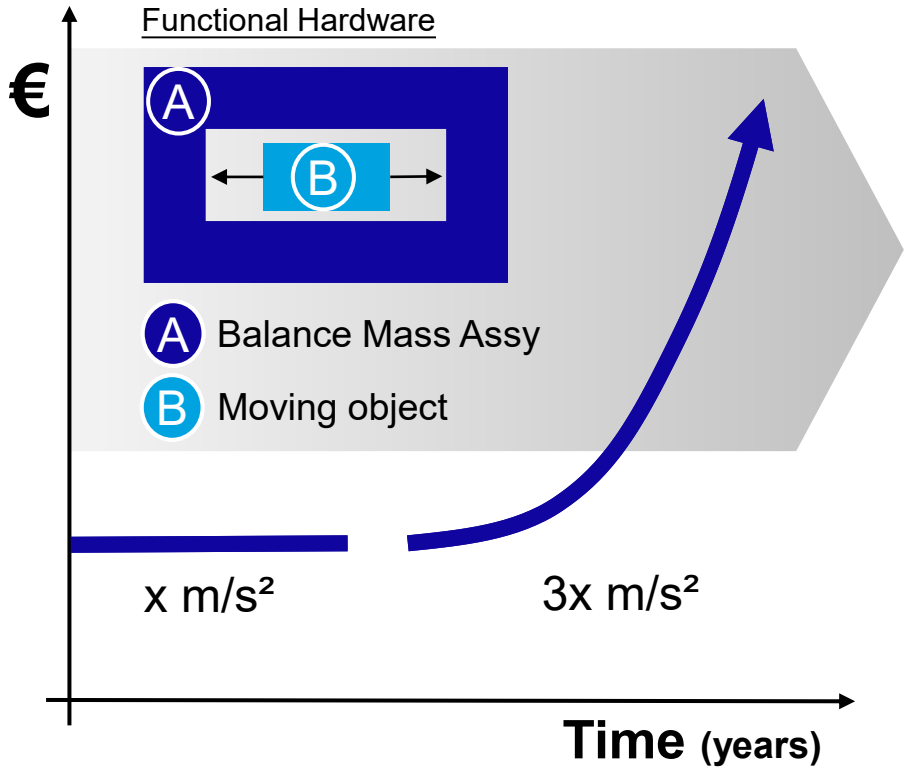
Higher Investments and Long-Lead Times extend the Return of Investments for Customer, ASML and Supply Chain.
As ~80% of the ASML Hardware is coming from our suppliers[1] joint efforts needed to optimize Lead Time and Costs



1. *Quote Goedings at Supplier Collaboration Day Jun'22*
2. *Graph as presented by Van den Brink during Global Leadership Meeting 2023*

Feedback-loop Manufacturing vs Design crucial to avoid unnecessary Costs

Real-life example of an exponential cost-increase driven by demand for higher accelerations



NXE:3600

EXE:5000

High

Relative Cost Impact of decision

Low

Product Development (Years)

Functional Trade-off:

- Increase number of motors (A) vs putting moving object (B) on a diet

Requirements:

- 20:1 Mass Ratio to moving object (B)

Material Choice:

- 316L Stainless Steel
- >3x more expensive than 5083-O

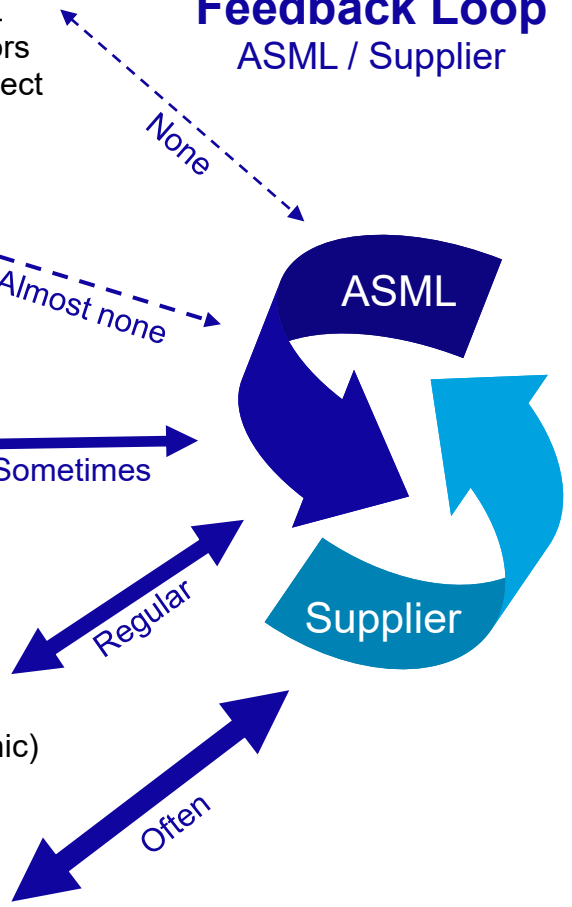
Geometry / Method:

- Forging / milling (Monolithic)
- ~80% Material Waste

Tolerances, Radii

- Special cutting tools (angle heads)
- >1500hrs of machining

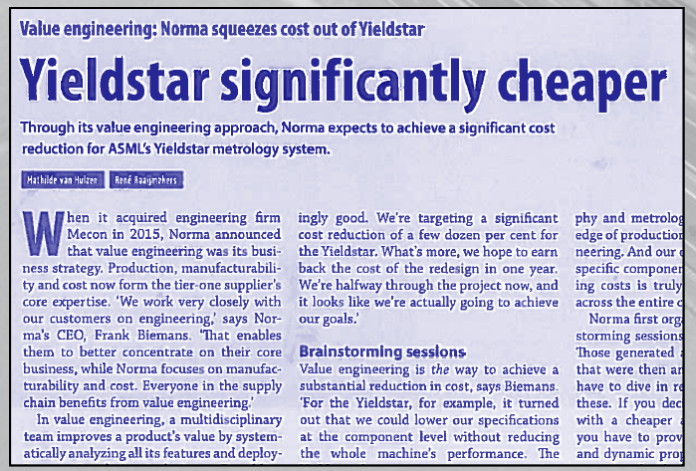
Feedback Loop
ASML / Supplier



ASML

Q&A

How can WE collaborate on closing the GAP between Design & Manufacturing in early design-phase?



Value engineering: Norma squeezes cost out of Yieldstar

Yieldstar significantly cheaper

Through its value engineering approach, Norma expects to achieve a significant cost reduction for ASML's Yieldstar metrology system.

Mathilde van Hulzen | René Raaijmakers

When it acquired engineering firm Mecon in 2015, Norma announced that value engineering was its business strategy. Production, manufacturability and cost now form the tier-one supplier's core expertise. 'We work very closely with our customers on engineering,' says Norma's CEO, Frank Biemans. 'That enables them to better concentrate on their core business, while Norma focuses on manufacturability and cost. Everyone in the supply chain benefits from value engineering.'

In value engineering, a multidisciplinary team improves a product's value by systematically analyzing all its features and deploy-

ingly good. We're targeting a significant cost reduction of a few dozen per cent for the Yieldstar. What's more, we hope to earn back the cost of the redesign in one year. We're halfway through the project now, and it looks like we're actually going to achieve our goals.'

Brainstorming sessions

Value engineering is *the* way to achieve a substantial reduction in cost, says Biemans. 'For the Yieldstar, for example, it turned out that we could lower our specifications at the component level without reducing the whole machine's performance. The

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Early supplier involvement leads to cost savings

NTS is ASML's partner for the development and manufacturing of the source support frame and the reticle stage service unit, among other things. By looking critically at the initial design and the production process, the company was able to drastically reduce the modules' cost price.

Alexander Pil

Value engineering and cost-down projects: two topics you don't immediately associate with ASML, which generally puts technological superiority and functionality front and centre. But the competition isn't sitting still, and they're putting better

er at NTS. 'Together, we look for points of improvement and places where things can be done more cheaply. That's also the route that NTS wants to take towards its customers: providing them with maximum support for their non-core products. We do that

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Roadmapping and a constant focus on cost

Value engineering plays a central role in Hittech's relationship with the customer

The cost savings that Hittech's smart machining approach achieves are often spectacular. 'We're good at peeling complex parts down to their cost price. We use continuous roadmaps to provide value engineering.'

René Raaijmakers

In 2012 ASML asked Marco Verloop and Koen Mentink to come to Veldhoven and share their vision on 3D metal printing. The Hittech directors made an agreement beforehand: at a strategic moment during

create through machining – but it had never quite gotten the go-ahead. Hittech decided to invest in a special pilot project to convince its customer.

When Mentink placed the part on the

have something tangible, we can in
skip over a huge part of the conver
says Verloop. That's why Hittech re
frees up time and money for a develo

ASML suppliers on adopting Value Engineering and Design for Manufacturing

Thanks!

Jeroen Aerts, Goof Pruijsen
High-NA System Engineer Cost of Goods, Value Engineer

Veldhoven