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Equipment control tools for longer machine lifetime and material rescue

Enabling smart manufacturing and
new processes for fab automation



A normal day in a fab

Hey Bob!

Did you know, that the average machine life time for production is 15 to 20 years?

No Joe, I did not!

But every company loses about 37,500 USD by equipment failures in Europe? Each year! On average!!

Deeper questions arise

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Oh, I wonder
what
downtimes cost
our company!

Downtime is just one
thing!

Also consider the
material losses or
cost for equipment
damage!



Relieving thoughts

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It's good to know that semiconductor fabs run safe at about 99,5% of the time!

We are safe from unscheduled downtime!

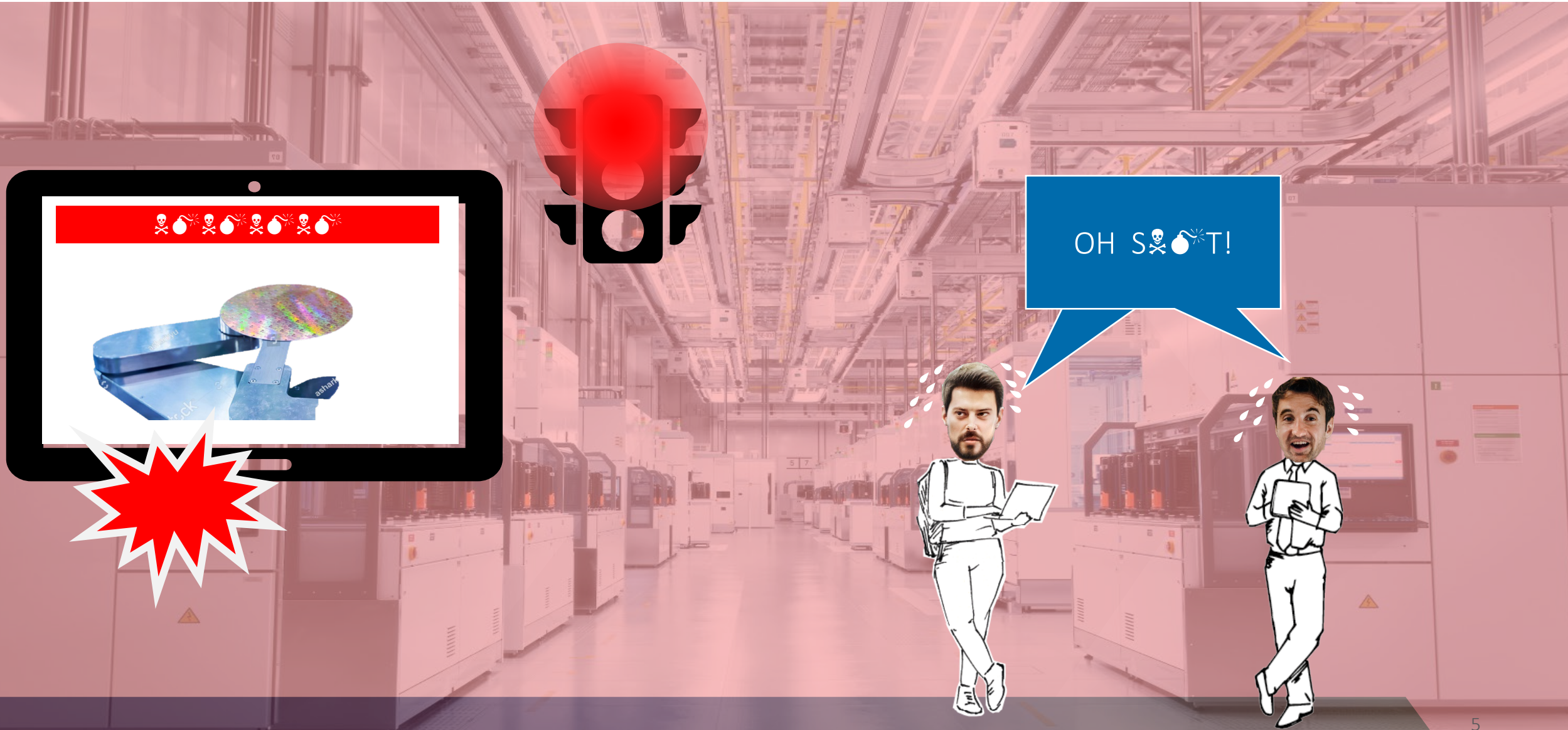
YEAH!
Something like that will DEFINITELY not happen to us!

HAHAHAHA....

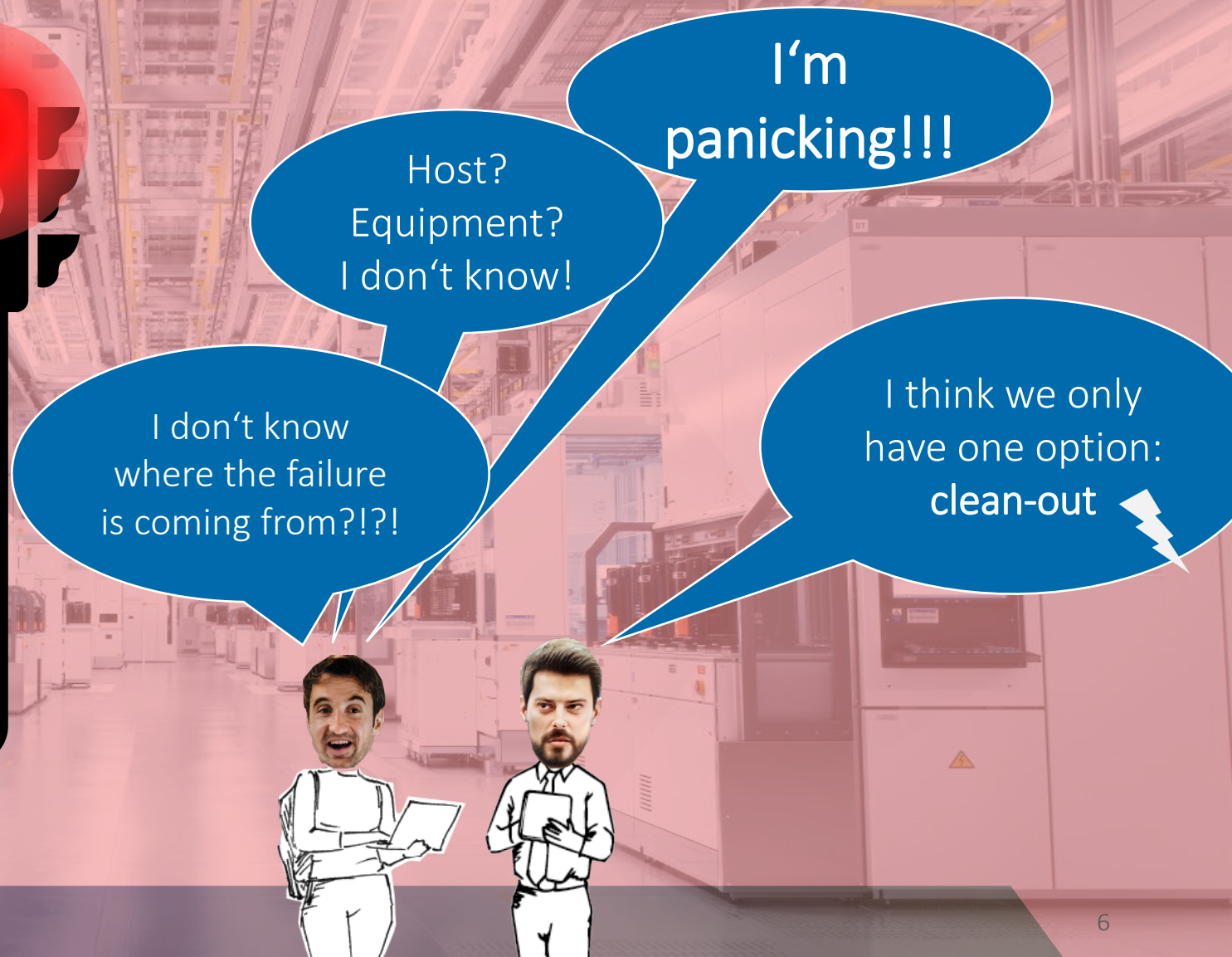
The unbearable thing happens

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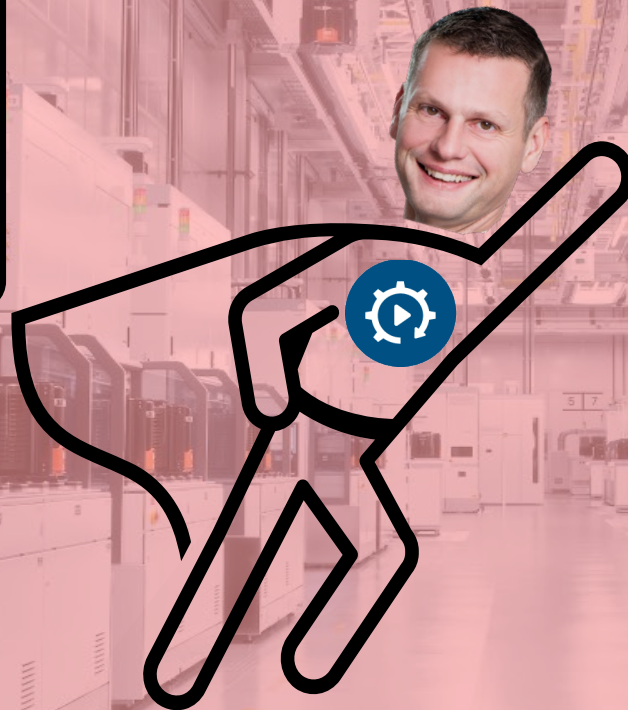
Panic mode takes over



Is it a bird? Is it a plane?

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It's Equipment Control Man!!!!



There is a better way!

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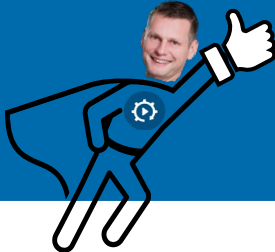
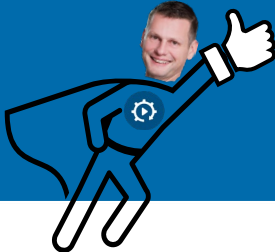
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I am so sorry for your
wafer loss!
Let's make sure this won't
happen again.
There are tools that can
help you!

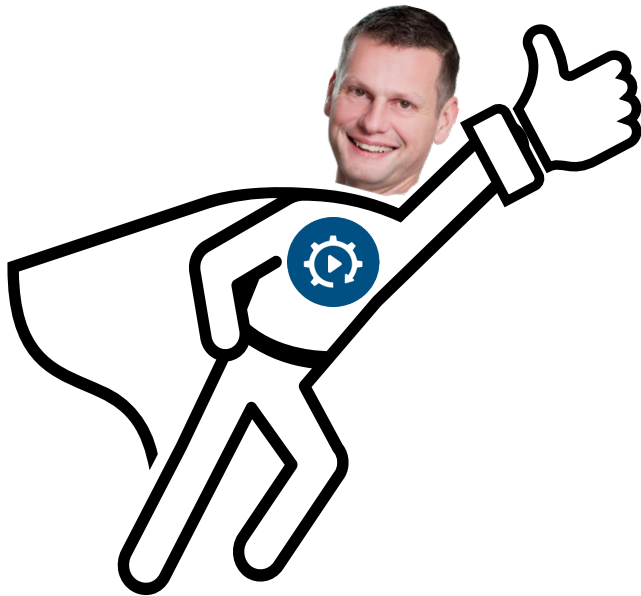


Types of failures, causes and consequences

	Human errors	Handling failures	Equipment damage
Example	Wrong parameters were set in engineering mode.	No detections of substrate possible.	Robot halts in load lock. Position of robot is unclear and someone closes the load lock.
Possible cause	› Insufficient user management and/or role permissions	› Wafer bent in processing › Sensor failure › Age and wearing of equipment	› Operating mistake › Sensor failure
Consequence	› Complete content of process chamber lost – even more if not detected › Difficult steps for material rework	› Loss of production time and material	› Equipment unavailable for production for longer time › Costly repair of equipment

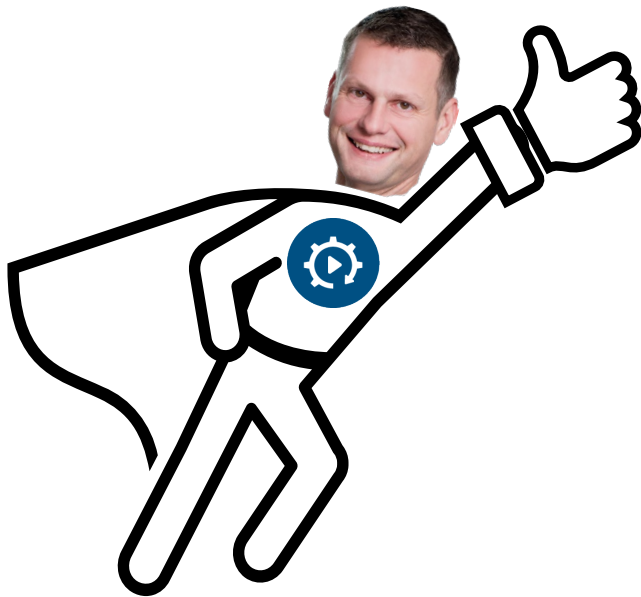
	Human errors	Handling failures	Equipment damage
Example	Wrong input	No display	Robot position error
Possible cause	✓ Sufficient user management and role permissions	✓ User-guided recoveries with options for material rescue next to clean-out option	✓ User-guided recoveries including plausibility checks for chosen option
Consequence	✓ Interlock handling with real-time visualization	✓ Quality indication of displayed values	✓ System diagnosis for experts
			

Proactive measures



- › **Automated testing and simulation** while equipment and equipment control development to correct mistakes early on
- › **Thorough testing** during commissioning
- › **Provide transparency and guidance** for operators and service engineers
- › **Real-time equipment monitoring and predictive maintenance** based on well-structured data provided by equipment control
- › **Security measures according to SEMI E187 and E188** against damages caused by external influences

Tools for acute troubleshooting



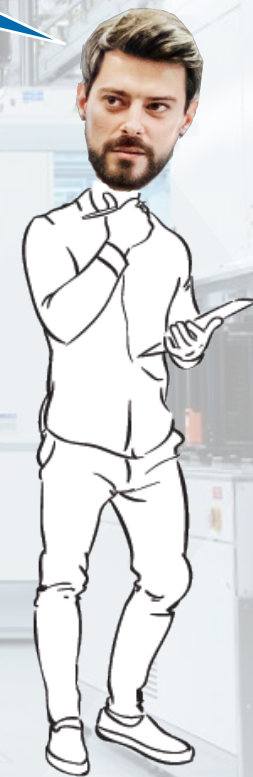
- › **Provide transparency and guidance** for operators and service engineers
→ e.g., real time interlock visualization, guided recoverys
- › **Real-time equipment monitoring** based on data from equipment control
→ provide data well structured and detailed
- › **Easy troubleshooting directly at equipment to save time**
→ e.g., ToolCommander® system diagnosis for live-debugging without high-level language programming

Let me introduce you to some tools

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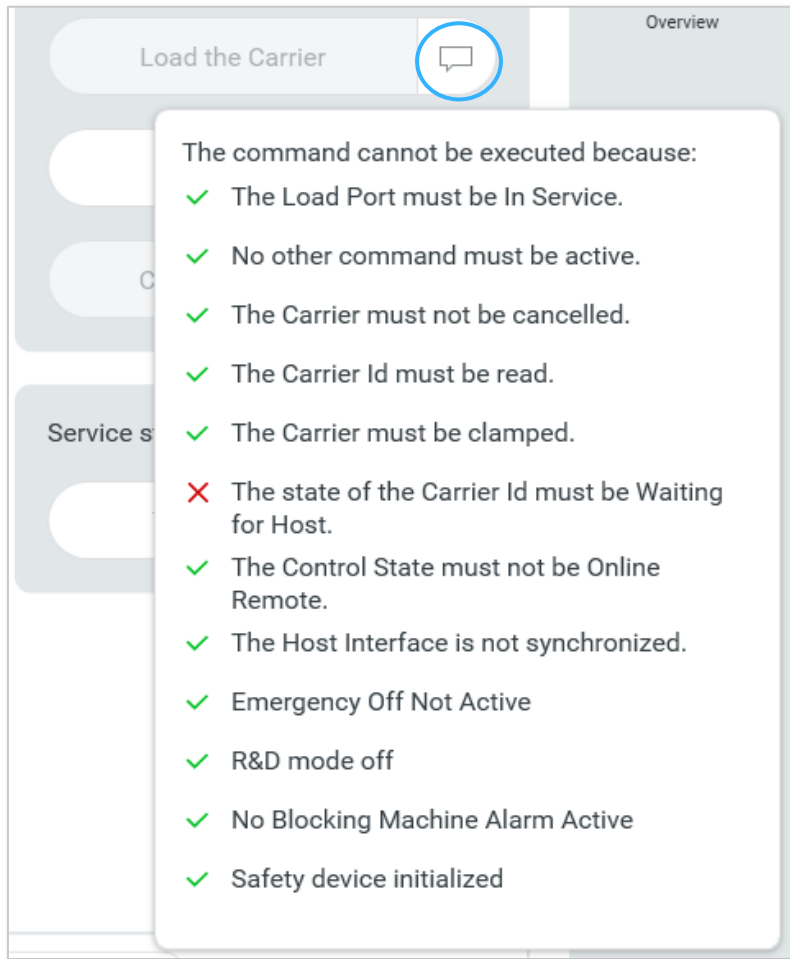
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And what could that look like,
mighty Equipment Control Man?



Transparency

Interlock visualization in real-time



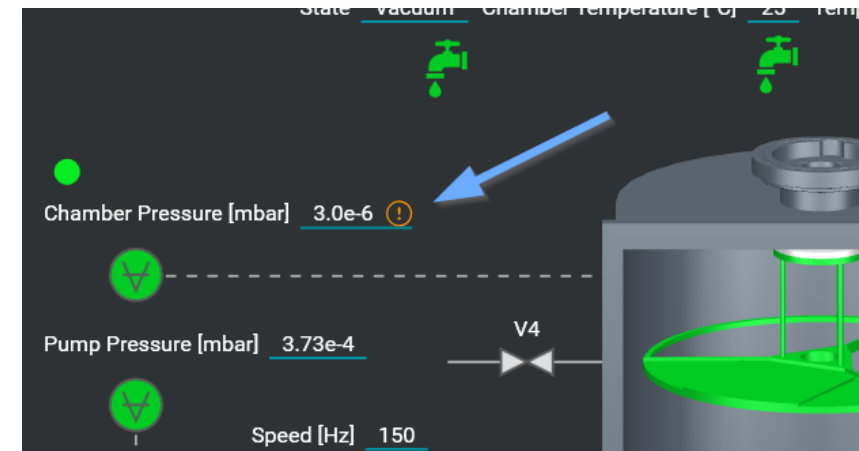
- › Interlocks as security measure
- › Visualization of interlocks gives operators a fast overview and understanding of situation
- › Removes uncertainties



Transparency

Quality of displayed values

- › Signs and icons give permanent information on data quality
- › Fast and reliable information on e.g. data actuality, occurring noise, sensor failure



We can detect
system errors early
to avoid major
damage!

Whooooaaaa!!!



Recovery mode

with material rescue option and operator guidance

The screenshot displays the 'Alarms' section of the 'Transport Logic Controller' interface. A red alarm bar at the top indicates: '10/4/2023 2:17:48 PM Transport Logic Controller The location of material 'Carrier1.Wafer00' could not be determined.' Below this, a dialog box titled 'Transport Logic Controller' provides details about the failed command and offers recovery options.

Transport Logic Controller

Failed Command: Pick
Command Argument:
Material: Carrier1.Wafer00
Target Location: Transport System-Lower Arm

Occupation Sensor State:

Robot Arm:	Occupation Sensor State:	Material:
Transport System-Lower Arm	Empty	-
Transport System-Upper Arm	Empty	-

Please select a recovery action:

- Material at Destination (selected)
- Material at Destination
- Material at Selected Location
- No Material Location Update Required
- Material Lost

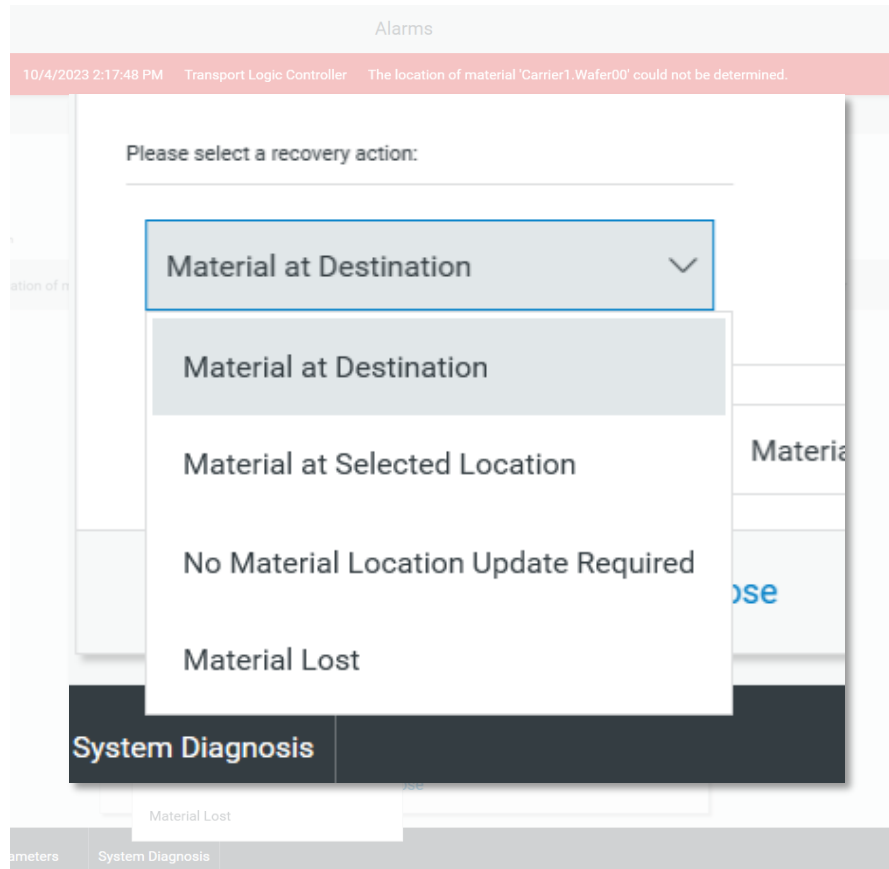
Material at Destination [X]

- › Easily understandable guided dialogs with choice of action options and plausibility check before actual action
- › Recoveries possible during production process, e.g. recovery in EFEM while wafer processing



Recovery mode

with material rescue option and operator guidance



- › Easily understandable guided dialogs with choice of action options and plausibility check before actual action
- › Recoveries possible during production process, e.g. recovery in EFEM while wafer processing

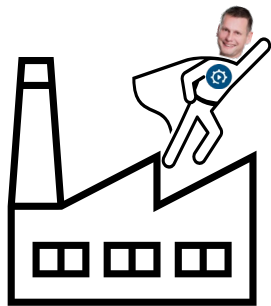
That's all I ever wanted!

We can avoid material scrap AND protect the equipment!



We are the experts.

And don't forget my valuable
partner:
SEMI Connectivity Solution Guy



ToolCommander®



We know this is the last day of
SEMICON Europa 2023 and we all are worn out.

So for more detailed information on equipment control
tools for longer machine lifetime and safe material rescue,
contact us, when you are back on track.

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Kontron AIS GmbH

📍 Find us in hall B2 at booth B2 379

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