

ON-DEMAND INLINE MIXING OF SC1 CHEMISTRY FOR STABLE MULTI-TOOL WET CLEANING SUPPLY

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TECHNOLOGY STARTS WITH THE RIGHT QUESTIONS

INNO-CUBE connects process understanding, measurement data and implementation.

UNDERSTAND

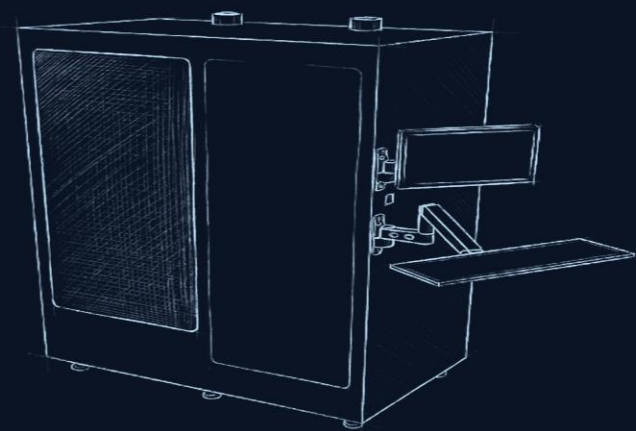
Make the system, consumption and operating conditions visible

DECIDE

Translate measurement data into a robust system design

IMPROVE

Validate step by step and operate sustainably



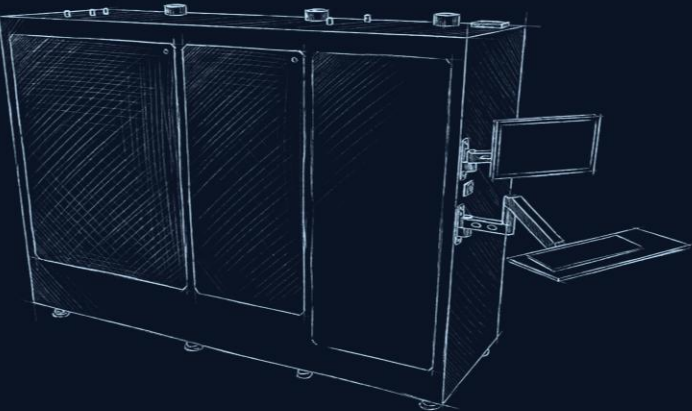
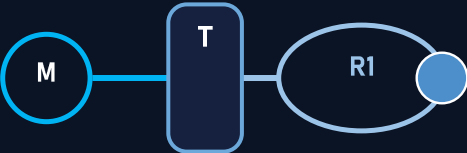
MINOS 100

1 MIXING MODULE
DIRECT SUPPLY



MINOS 110

1 MIXING MODULE
TANK + RECIRCULATION PUMP



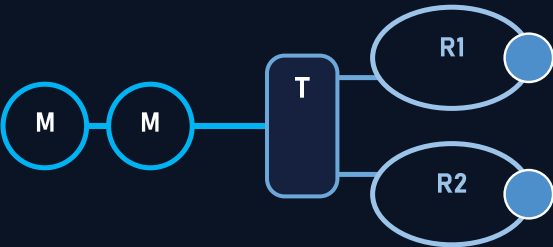
MINOS 210

2 MIXING MODULES
1 RECIRCULATION LOOP



MINOS 220

2 MIXING MODULES
2 RECIRCULATION LOOPS



FROM MANUAL PREPARATION TO INLINE BLENDING

SAFETY

Manual handling increased operator exposure and the risk of manual wafer breakage.

PROCESS CONTROL

New processes required stable, reproducible and traceable concentration control.

EFFICIENCY

Higher concentration and manual preparation increased chemical use and preparation time.

The process needed a **safer, more controlled and more efficient** supply concept.

THE CONCEPT

SC1 EXAMPLE: THREE MEDIA, ONE DEFINED MIXTURE

DI water, H_2O_2 and NH_4OH are metered under closed-loop control, mixed and supplied as SC1.

H_2O_2

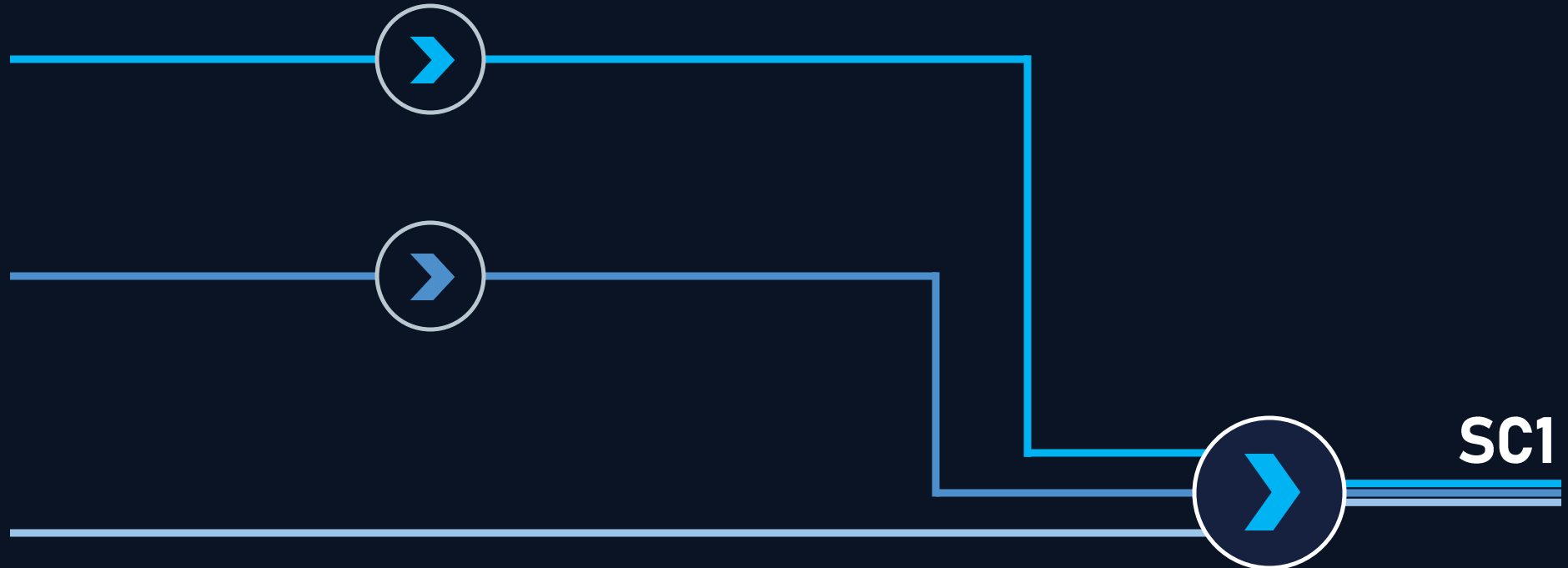
HYDROGEN PEROXIDE

NH_4OH

AMMONIUM HYDROXIDE

DI

DEIONIZED WATER



CONTROLLED DOSING · DEFINED MIXING · DIRECT SUPPLY

PROBLEM

MITIGATING GAS ENTRAPMENT IN CHEMICAL SUPPLY LINES



BEFORE OPTIMIZATION

Visible gas accumulation and unstable flow behavior

OBSERVATION

Unstable flow behavior with unsteady flow pulses

ROOT CAUSE

Outgassing of SC1 and gas accumulation at tubing high points

ENGINEERING SOLUTION

Continuous upward tubing routing and reduced pressure drop by minimizing elbows

OUTCOME

Reduced gas accumulation and stabilized liquid flow

AFTER OPTIMIZATION

Reduced gas accumulation and stabilized liquid flow



PROBLEM

FROM MEASUREMENT ACCURACY TO MEASUREMENT ROBUSTNESS



Capacitive level measurement

Observed Challenge

Sporadic level jumps, conflicting refill commands and unstable tank control

Root Cause ?

Investigation

Grounding, reference checks and supplier troubleshooting produced no stable signal
Pump operation changed the dielectric properties of the SC1 solution, causing the capacitive level sensor to falsely detect a "Tank Full" condition.
Replaced capacitive sensing with ultrasonic measurement

Observed Result

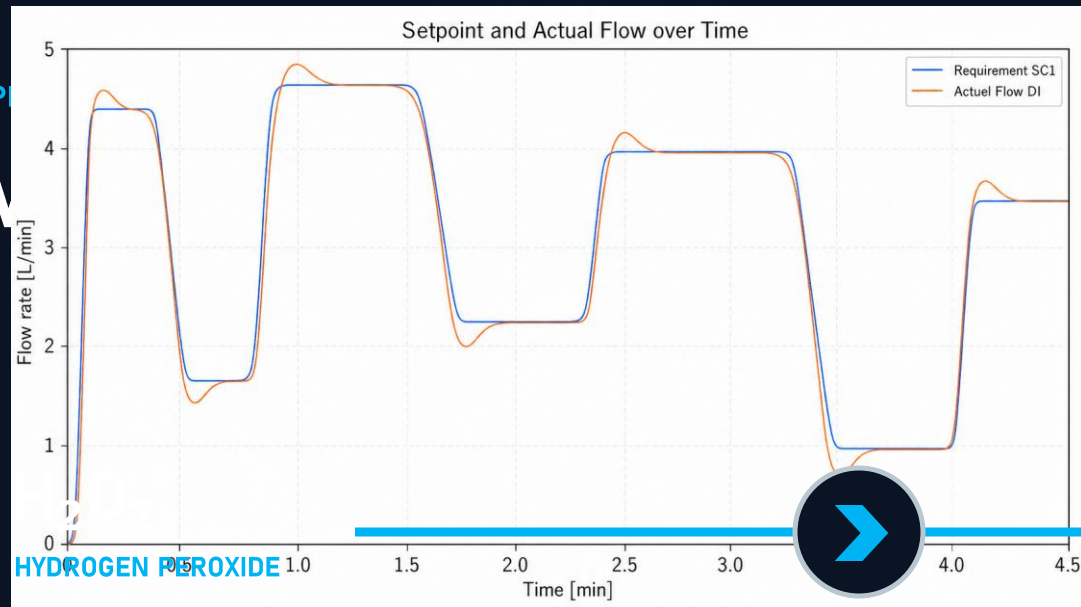
Stable level signal, reliable refill control and automatic operation



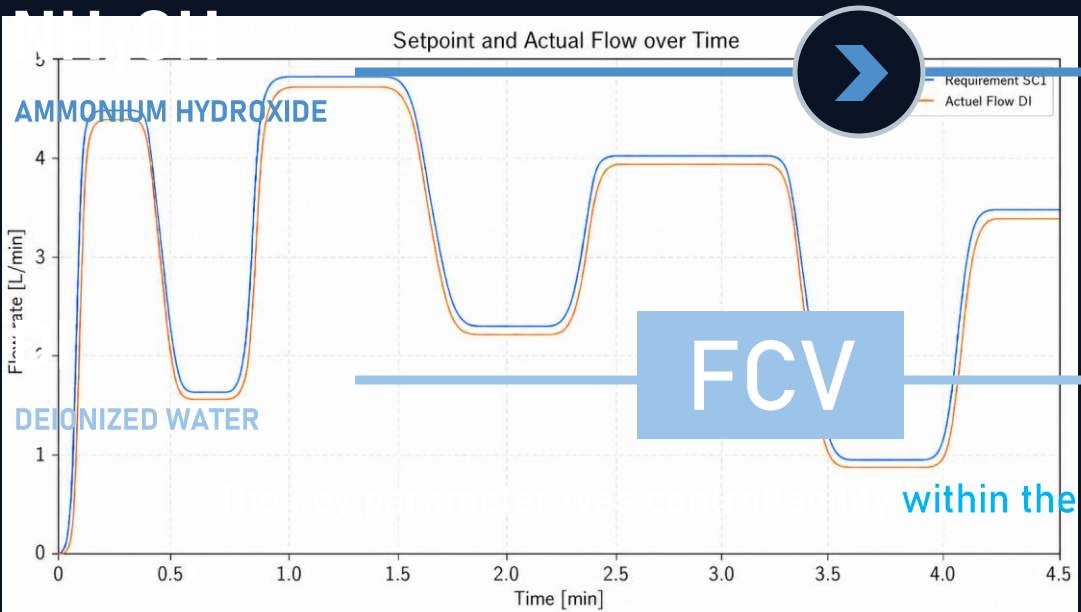
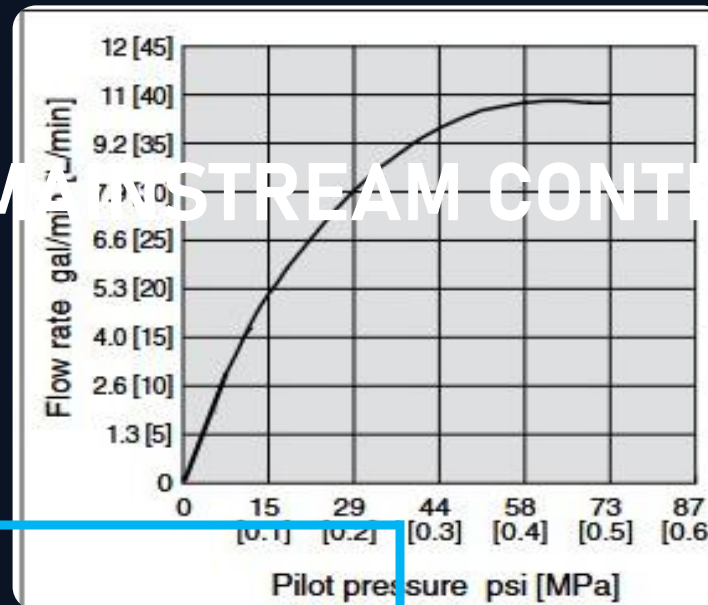
Ultrasonic level measurement

A principle that works under nominal conditions may still fail when sporadic disturbances affect closed-loop operation.

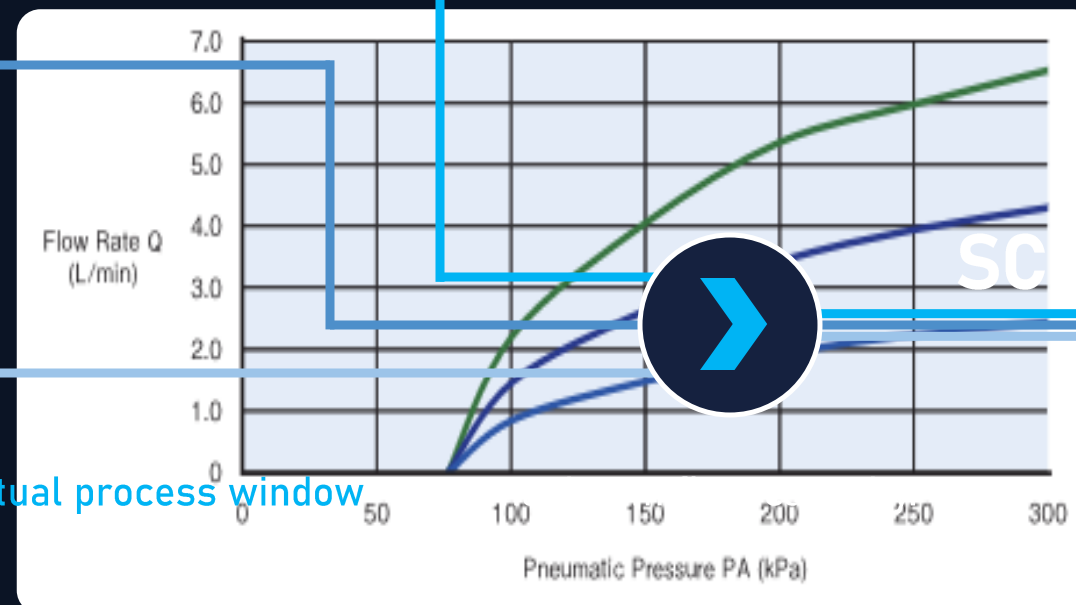
PLANT



DI M-STREAM CONTROLLABILITY



within the actual process window



EVIDENCE

STABILITY BECOMES VISIBLE WHEN IT IS MEASURED

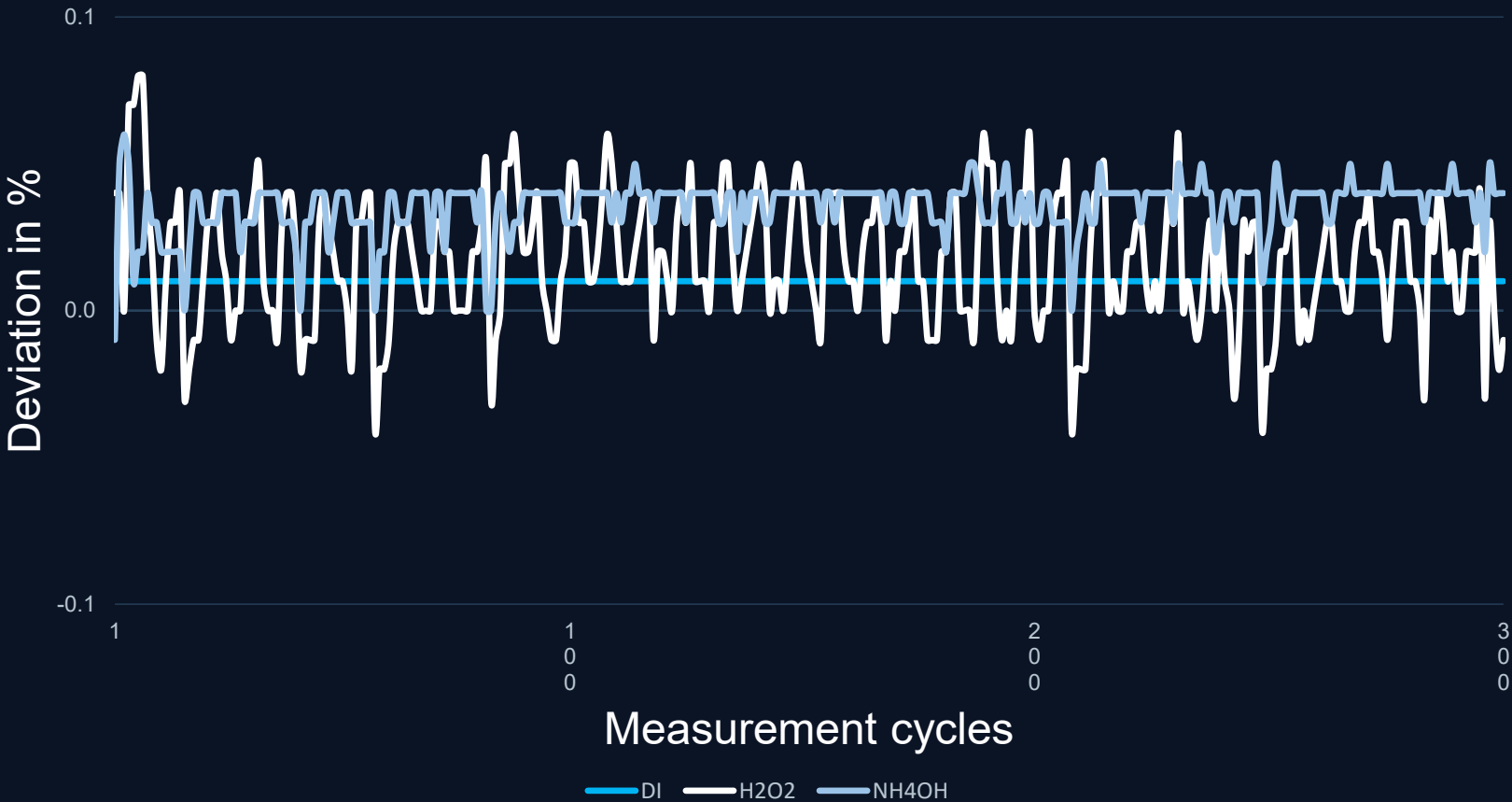
The chart shows the percentage deviation of the three media over the documented period.

DESCRIPTIVE ANALYSIS

DI	0.01 %
H ₂ O ₂	0.08 %
NH ₄ OH	0.06 %

Maximum absolute deviation per medium.

300 measurement cycles
Displayed reference band: ±3.00 %



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**Now what matters is
what works in real operation —
and what changes in practice.**

WHAT CHANGED IN OPERATION

97% PARTICLE REDUCTION ON WAFERS

improved reproducibility and full process traceability

VIRTUALLY ELIMINATED MANUAL WAFER BREAKAGE

increased automation and reduced operator intervention

63.5% LOWER CHEMICAL CONCENTRATION

reducing chemical consumption while maintaining cleaning performance

83% SHORTER PROCESS PREPARATION TIME

reduced manual handling and recipe-based concentration control



QUESTIONS & DISCUSSION

THANK YOU



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