

Essential Instruments for Quality Management

Featuring André Lohse of SITA Messtechnik



product quality
cleaning workshops

The PQCW offers practical,
hands-on and independent,
training in cleaning.

More Info
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Webinar Hosts

The PQCW Team




Barbara and Ed Kanegsberg - “The Cleaning Lady and the Rocket Scientist”

- BFK Solutions - Consultants in Critical Cleaning
- Authors and Editors of the two-volume CRC Handbook for Critical Cleaning
- Independent evaluations and recommendations
- Co-chairs of the Product Quality Cleaning Workshops
- barbara@bfksolutions.com and ed@bfksolutions.com



Darren Williams - “The Professor”

- Professor of Physical Chemistry at Sam Houston State University
- Leader of the Cleaning Research Group
- Co-chair of the Product Quality Cleaning Workshops
- Performs cleaning trials and formulates cleaning chemistries
- williams@shsu.edu




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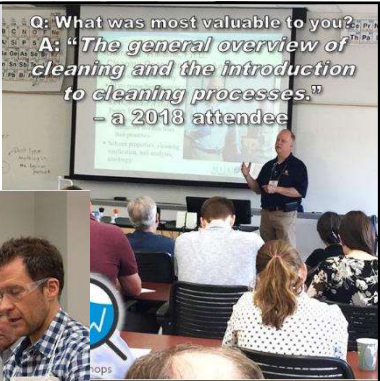
Product Quality Cleaning Workshops

- ▶ Workshops
- ▶ Webinars
- ▶ Resources for more effective cleaning processes
- ▶ More information
 - ▶ shsu.edu/pqcw
 - ▶ bfksolutions.com/manufacturing-minds-pqcw/


"The vendor demos were great."
— a 2018 attendee



Q: What was most valuable to you?
A: *"The general overview of cleaning and the introduction to cleaning processes."*
— a 2018 attendee



"All the lab activities were interesting and made me think about things I need to consider in my own lab work."
— a 2018 attendee



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Our Speaker

André Lohse



- Head of the applications team of the German-based company SITA Messtechnik
- Master degree in electrical engineering and automation
- Since 2007, involved in monitoring, optimization, and quality assurance of industrial cleaning processes
- Frequent speaker at cleaning conferences, training seminars, technical consultancy, and articles
- Coauthor of the guideline "Filmic contamination in Control" by the German association of parts cleaning.

10/14/2020

PQCWebinar with Andre Lohes of SITA Messtechnik

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Essential Instruments for Quality Management

SITA Messtechnik GmbH
www.sita-process.com | www.sita-lab.com

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SITA Messtechnik GmbH, Germany



German engineering and expertise in quality assurance of industrial cleaning for over 20 years.

Easy-to-use instruments for at-line measurements and on-line systems for process integration.

Monitoring of Process Liquids

SITA **DynoTest**
Surfactant Concentration



SITA **ConSpecto**
Bath Contamination

Inspection of Part Surfaces

SITA **SurfaSpecto**
Surface Wetting



SITA **Cleanspecto**
Parts Cleanliness

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SITA Lab Solutions

Surfactant Concentration and Surfactant Effect - Automatically Analysed

Advanced Surfactant Control




SITA science line t100 **SITA FoamTester**

The image shows two pieces of laboratory equipment against a background of water splashes. On the left is the SITA science line t100, a handheld device with a screen and buttons, connected to a probe in a glass. On the right is the SITA FoamTester, a larger white and blue machine with a transparent front panel showing internal components.

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Worldwide Support and Distribution



SITA


Introduction and Company Portrait | SITA Messtechnik GmbH

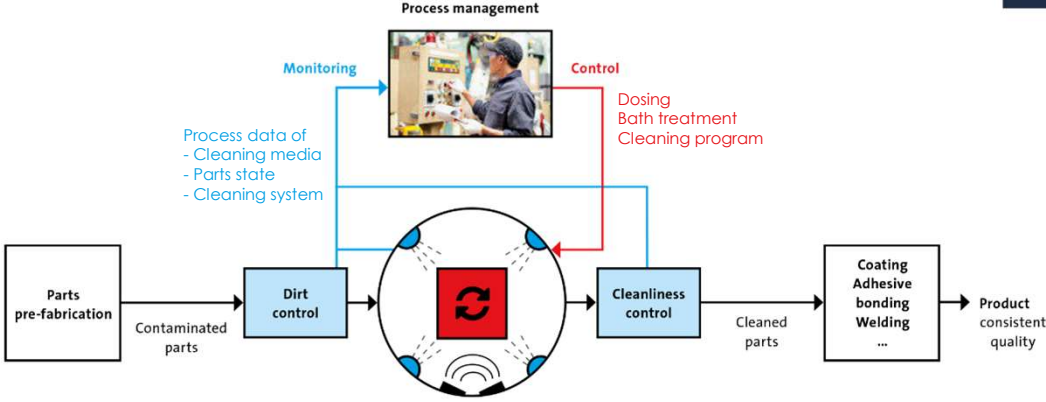
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A world map is shown with red dots indicating SITA distribution and support locations. The dots are concentrated in Europe, with several in North America, South America, Asia, and Australia. A small SITA logo is placed over the European continent.

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Quality Assurance of Parts Cleaning in Production Chain






Tasks of Quality Assurance:

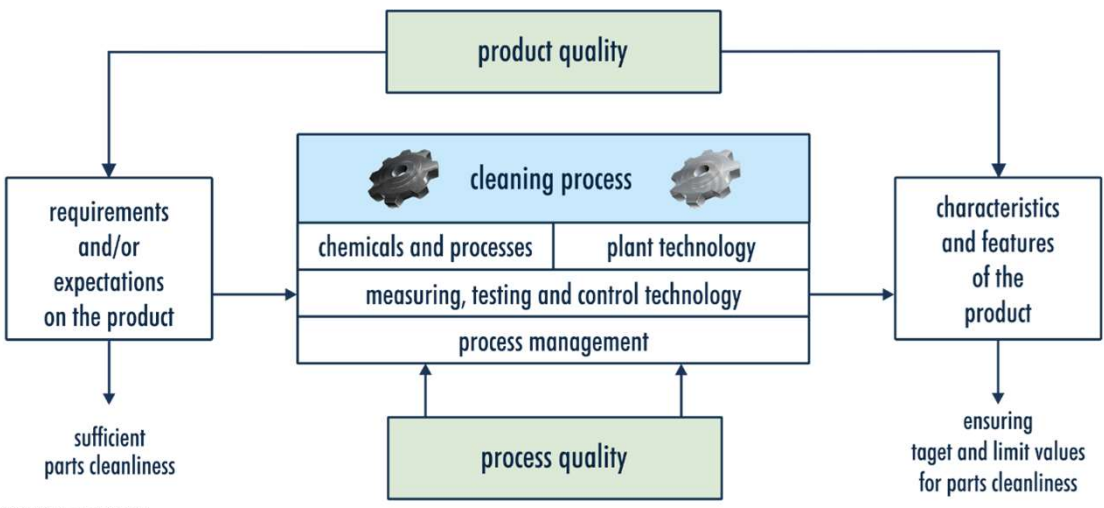
- Understanding the contexts
- Defining control parameters
- Selecting measuring methods
- Developing process management

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Context of Process and Product Quality

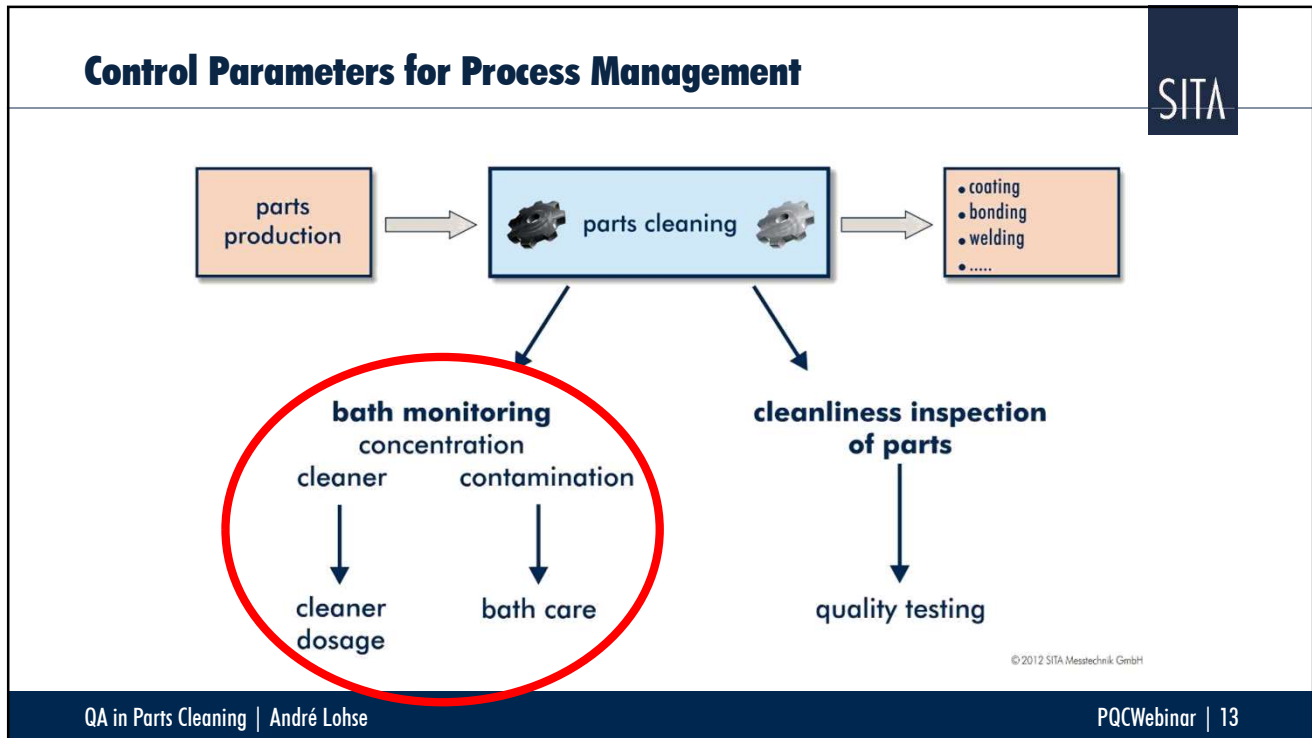




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Monitoring Tasks in Aqueous Cleaning

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Concentration of Cleaner Components

- Builder
- Surfactant
- Corrosion protection

Concentration of Bath Contamination

- Oils, grease, waxes, emulsions
- Particles
- Detergent introduced into rinsing baths









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Bath Monitoring Methods

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Cleaning Agents

Builder

- Acid-base titration
- Conductivity, Ultrasonic, pH measurement



Surfactant

- HPLC, IC, potentiometric titration
- Photometric cuvette test
- Bubble pressure tensiometry



Bath Contamination

- Acidulation
- IR, Fluorescence, Turbidity
- Particle analysis
- ...



Bubble Pressure Method

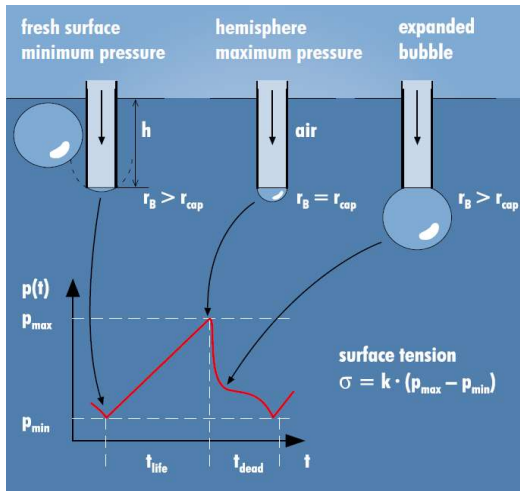
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- Air bubbles form at the capillary tip
- Internal pressure changes during bubble formation

Bubble Pressure Method

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- Air bubbles form at the capillary tip
- Internal pressure changes during bubble formation
- Difference between minimum and maximum pressure
- Measuring time is adjustable: Bubble lifetime (surface age)

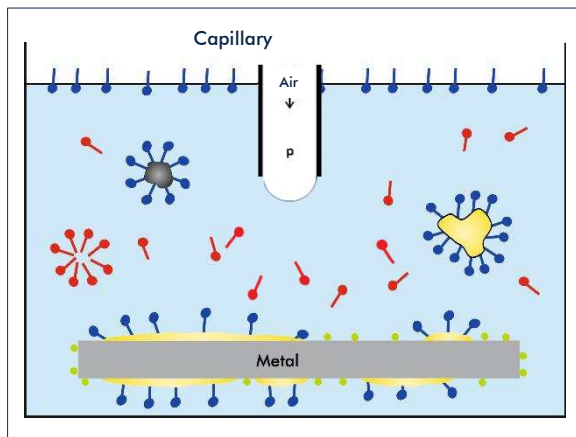
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Determination of Washing-active Surfactants in Process Liquids

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- Air bubbles are a new surface
- Active surfactants move there
- Only free surfactants, surfactants bound to oil are not detected
- Thus the method only responds to surfactants available for further cleaning

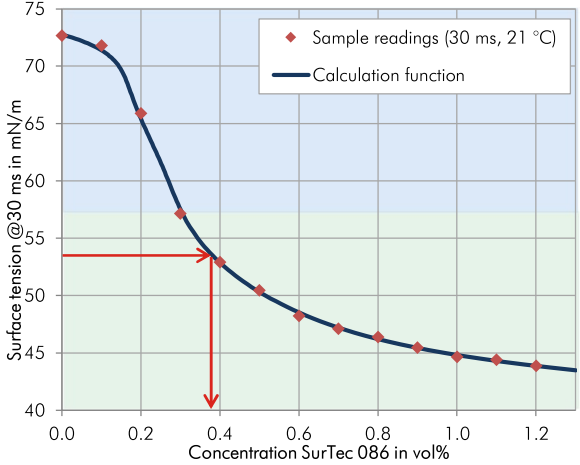
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Tensiometry for Surfactant Monitoring






Concentration SurTec 086 in vol%	Surface tension @ 30 ms in mN/m
0.0	73
0.1	72
0.2	66
0.3	58
0.4	53.2
0.5	50
0.6	48
0.7	47
0.8	46
0.9	45
1.0	44
1.1	44
1.2	43



Mobile at-line tensiometer for flexible use and measurement of multiple cleaning and rinsing baths and concentration output



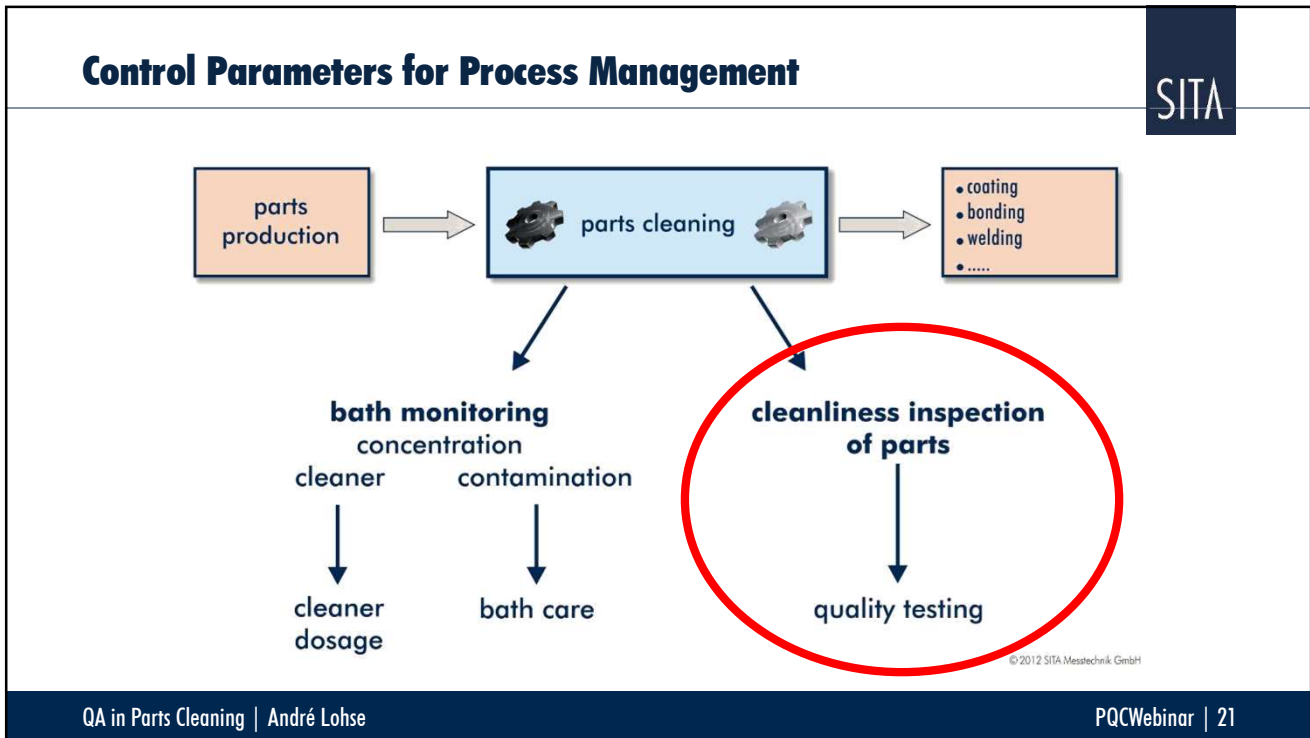
On-line tensiometer for process integration with self-cleaning and automatic calibration

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Common Techniques for Cleanliness Inspection (Filmic Contamination)

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For Process Control

- Visual inspection
- Wipe test
- Water break test
- Dyne test inks
- Contact angle measurement
- Fluorescence measurement

For (Failure) Analysis in Laboratory

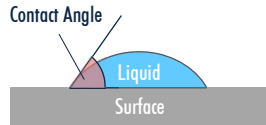
- Extraction/gravimetry of none-volatile residues (NVR)
- Total organic carbon (TOC)
- IR spectroscopy
- Electron microscopy/X-ray spectroscopy (SEM/EDX)
- X-ray photoelectron spectroscopy (XPS)
- Gas chromatography with mass spectrometry (GC-MS)
- Residual gas analysis (RGA)
- Time of flight - Secondary ion mass spectrometry (ToF-SIMS)

→ Guideline „Filmic Contamination in Control“

SB8

Measure Contact Angle – Test Wetting Behaviour

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Wettability is sensitive to changes in surface condition

- Wetting inhibiting and promoting substances,
- Oxidation and adsorption layers,
- Chemical or physical activation/passivation

SITA SurfaSpector

- Mobile water contact angle measurement to check wettability
- Patented method – easy handling on complex geometries
- Allows quality inspection directly in production environment
- Use for:

Cleanliness Inspection

Surface Treatment Monitoring

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Method Overview: Techniques for Testing Wetting Behaviour

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	Water break test	Dyne test inks	Contact angle
Invest:	low	low	medium
User impact:	subjective	subjective	objective
Value:	no	yes	yes
Remark:	/	can be poisonous (consider H&S), comparability only with same ink (manufacturer/formulation)	/
General:	Wettability increases or decreases depending on the kind of the contamination or the treatment		



Example Image Source: Heaton.com



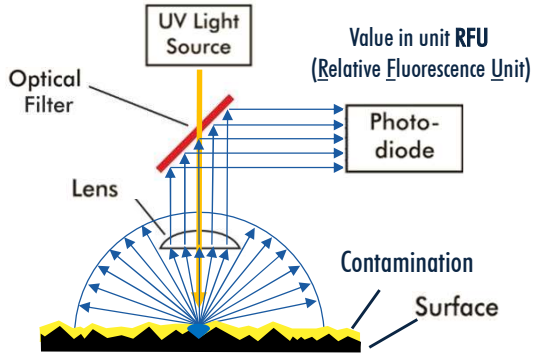
Example Image Source: Tigris information leaflet dyne test inks



SITA SurfaSpector

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Measure Fluorescence – Inspect Cleanliness



SITA CleanoSpector – Fluorescence measurement

- Optical method
- Detection of residual oil, cooling lubricants, separating agents etc.
- Fluorescence signal increases with film thickness/contamination quantity
- The lower the RFU-value the cleaner the surface
- Standardised with SITA Calibration Standards
- Contact free, non-destructive, in-line capable, thickness sensitive
- Use for:

Cleanliness Inspection Coating Thickness Inspection



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Application: Process Design and Optimization

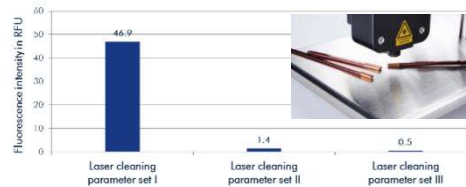


Benchmark cleaning processes

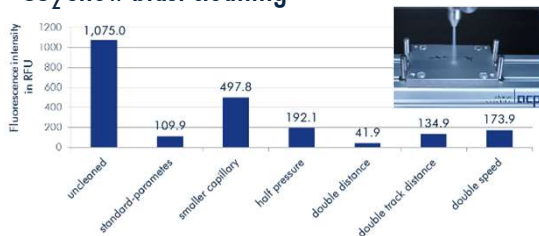
uncleaned	cleaning machine P	cleaning machine R-1	cleaning machine R-2
601.8 RFU	7.9 RFU	1.4 RFU	2.7 RFU



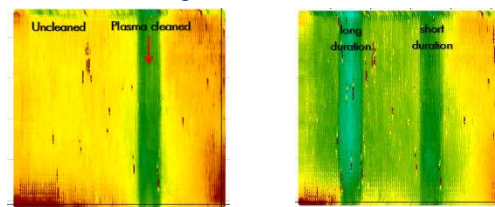
Laser cleaning



CO₂ snow blast cleaning



Plasma cleaning



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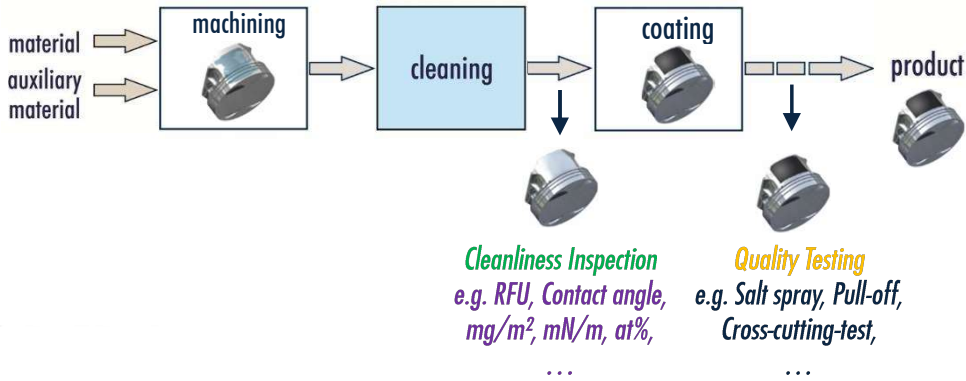
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SB10

The Limit Value is Set by the Process

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- *Not the weight, the carbon content, ... of the contamination, but its chemical-physical interaction with the subsequent process influences the quality!*
- *Sufficient cleanliness: The measurement method indirectly checks the cleanliness, the subsequent process (Quality Testing) defines what is sufficient!*

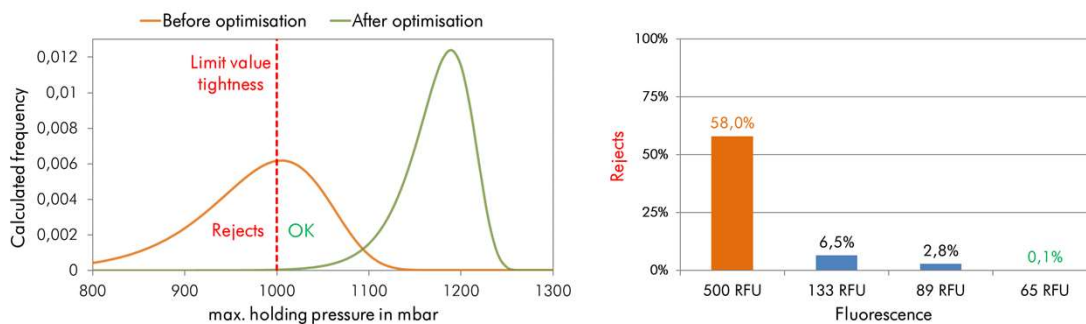
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Application: Bonding of Gas Meter Housings

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Application: Bonding of gas meter housings, optimisation of cleaning process
Starting point: Limit value gas tightness of the bond increased, consequence: 58 % rejects
Solution: Optimisation of cleaning process, monitoring effect with fluorescence measurement

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Concentration measurement.
Cleanliness inspection.
Contamination monitoring.

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