INTRODUCTION TO CLEANING INDICATORS

Jan Sanders
EMEA Marketing Manager (IR)
INTRODUCTION TO EN15883.
Introduction to EN15883

What is the content of this validation norm for WD’s

- Part 1: General requirements, terms and definitions and tests
- Part 2: Requirements and tests for washer-disinfectors employing thermal disinfection for surgical instruments, anesthetic equipment, bowls, dishes, receivers, utensils, glassware, etc.
- Part 3: Requirements and tests for washer-disinfectors employing thermal disinfection for human waste containers
- Part 4: Requirements and tests for washer-disinfectors employing chemical disinfection for thermo labile endoscopes
- Part 5: Test soils and methods for demonstrating cleaning efficacy [Technical Specification]
Introduction to EN15883

Part 1 - 6.10 Test of cleaning efficacy

6.10.1 General

During tests of cleaning efficacy, the cycle shall be run without a disinfection stage.

The drying stage may also be omitted if this is necessary to facilitate the detection of residual contamination or test soil.
This part of ISO 15883 specifies general performance requirements for washer-disinfectors (WD) and their accessories that are intended to be used for cleaning and disinfection of re-usable medical devices and other articles used in the context of medical, dental, pharmaceutical and veterinary practice.

It specifies performance requirements for cleaning and disinfection as well as for the accessories which may be required to achieve the necessary performance.

The methods and instrumentation required for validation, routine control and monitoring and re-validation, periodically and after essential repairs, are also specified.

Guidance on a routine test program is given in Annex A.
6.10.2 Cleaning efficacy test 1

6.10.2.1 General

The tests for cleaning efficacy shall be carried out using the appropriate test method(s) and test soil(s) as described in ISO/TS 15883-5 by taking into consideration the corresponding category of load. (See also References [24] to [39].)

The attention of users is drawn to local regulations that can require the use of particular test soils and test methods.

The attention of manufacturers is drawn to the user’s choice of test soil(s) and method(s) for operational testing; this can indicate a need to carry out similar testing before the WD is supplied.

The test soil used for the load, chamber wall and load carriers may not be the same. Where different test soils are used the rationale for the choice of test soil should be documented.
6.10.2 Cleaning efficacy test 1

6.10.2.2 Procedure

Contaminate the test load, chamber walls and load carrier with the test soil as described in the relevant test method of ISO/TS 15883-5.

Operate a normal wash cycle for the load type under test.

After completion of the wash cycle, examine the test load, chamber walls and load carrier for the presence of residual test soil using the method described in the relevant test method of ISO/TS 15883-5.

6.10.2.3 Results

The test result shall be regarded as satisfactory if it meets the criteria given in the relevant test method of ISO/TS 15883-5.
6.10.3 Cleaning efficacy test 2

6.10.3.1 General

This test is undertaken following satisfactory completion of cleaning efficacy test 1 and the thermometric tests (see 6.8). The WD shall be tested using actual loads contaminated by normal use, specified by the user as being representative of loads that it is intended to process.

6.10.3.2 Procedure

Operate no less than three cycles using actual loads contaminated by normal use of the type that it is intended to process.

Visually assess the cleanliness of the processed items.

Video on visual clean
https://www.youtube.com/watch?v=QAT0TC8lTs0
6.10.3 Cleaning efficacy test 2

When the items are visually clean, one of the methods given in Annex C shall be used to detect the presence of residual protein contamination.

When other methods will be used routinely for assessing the acceptability of items processed through the WD, the test method to be used shall be agreed between the user and the manufacturer.

6.10.3.3 Results

Report the composition of the test load, the method(s) used to assess the cleanliness of the load and whether all parts of the load were found to be free from residual contamination by the test method used.
### Introduction to EN15883

#### Part 5: Test soils and methods for demonstrating cleaning efficacy

#### Table A.1 — Summary of test programmes for WDs

<table>
<thead>
<tr>
<th>Brief description of test</th>
<th>Requirements clause</th>
<th>Test clause</th>
<th>Type test</th>
<th>Works test</th>
<th>Operational qualification</th>
<th>Performance qualification</th>
<th>Routine test</th>
<th>Validation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleaning efficacy</td>
<td>4.2.1.1</td>
<td>6.10.2</td>
<td>X</td>
<td>B</td>
<td>X</td>
<td>B</td>
<td>B</td>
<td>X(0)</td>
</tr>
<tr>
<td>1.1 Chamber</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>1.2 Load carrier</td>
<td>5.1.10</td>
<td>6.10.2</td>
<td>X</td>
<td>B</td>
<td>X</td>
<td>B</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>1.3 Reference load</td>
<td>4.2.1.1</td>
<td>6.10.2</td>
<td>X</td>
<td>B</td>
<td>X</td>
<td>B</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>1.3 Load</td>
<td></td>
<td>6.10.3</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Real load user defined</td>
<td></td>
<td>(visual)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Annex C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>

- **X** recommended
- **B** not recommended
- **O** optional test which can be requested by the purchaser or user
- **Q** verification of calibration at the value(s) of interest for the particular instrument e.g. the disinfection temperature
- **Q** quarterly test interval, **W** weekly test interval, **D** daily test interval;
## Part 5: Test soils and methods for demonstrating cleaning efficacy

### Table 1 — Summary of test soils including their allocation to the type of load

<table>
<thead>
<tr>
<th>Load type</th>
<th>Country code</th>
<th>Reference in Bibliography</th>
<th>Constituents of soil</th>
<th>Annex in this Technical Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical instruments (including rigid endoscopes)</td>
<td>AT</td>
<td>[34]</td>
<td>Heparinized sheep blood coagulated with protamine</td>
<td>Annex A</td>
</tr>
<tr>
<td></td>
<td>DE</td>
<td>[32], [33]</td>
<td>Sheep blood, <em>E. faecium</em>&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Annex G</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Egg yolk, <em>E. faecium</em>&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Semolina, butter, sugar, milk powder, <em>E. faecium</em>&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DE</td>
<td>[41], [42], [43]</td>
<td>Tetramethylbenzidine, hydrogen peroxide solution, bovine haemoglobin</td>
<td>Annex J</td>
</tr>
<tr>
<td></td>
<td>NL</td>
<td>[39]</td>
<td>Bovine serum albumin fraction 5, porcine gastric mucin type 3, bovine fibrinogen fraction 1, bovine thrombin</td>
<td>Annex K</td>
</tr>
<tr>
<td></td>
<td>UK</td>
<td>[28], [30]</td>
<td>Defibrinated horse/sheep blood, egg yolk, dehydrated hog mucin</td>
<td>Annex N</td>
</tr>
<tr>
<td></td>
<td>US</td>
<td>[31]</td>
<td>Protein/organic soil (user preference), <em>B. atrophaeus</em> endospores</td>
<td>Annex S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[47]</td>
<td>Albumin, haemoglobin, fibrinogen, thrombin</td>
<td></td>
</tr>
</tbody>
</table>
What about other countries?

What does local recommendation say?

比利时有一个由“Hoge gezondheidsraad”提出的建议

Controle na reiniging en ontsmetting

- Bij een visuele controle onmiddellijk na het reinigen en ontsmetten moet nagekeken worden of er geen residuen van chemische producten of vuilresten achtergebleven zijn.
- Bij een periodieke controle kan gebruik gemaakt worden van allerhande hulpmiddelen zoals testplaatjes, swap testen of een bevuilingstest. Het zijn hulpmiddelen die op een eenvoudige wijze snel aangeven dat de beoogde kwaliteit al dan niet bereikt werd.

Er is geen vermelding wat de resultaten van die bijkomende testen moeten zijn
HOW CAN A CLEANING VALIDATION BE DONE ACC EN15883?

As an example; this is how the Austrian validation is done.
Introduction to EN15883

How to prepare instruments according EN15883-5

A.7.1 Ordinary surgical instruments

- Allow the blood to equilibrate to room temperature before use. Clean and dry the test instruments thoroughly. Apply the test soil to joints and corrugate surfaces of the instruments at ambient temperature using a paintbrush. Take care that the blood is used within approximately 10 min (in any case before complete coagulation).

- The total amount of the test soil should be about 0.05 % of the amount of water for the cleaning phase in the tank of the WD (e.g. 20 l water; 10 ml blood).
Place 20 pieces of the soiled instruments horizontally and at random on each of the trays. All instruments shall be prepared and arranged on the tray within 30 min. Leave the instruments on the tray to dry at ambient temperature and humidity for approximately 30 min. Then take each of the instruments and check them for excessive test soil (e.g. coagulated test soil spots \( \leq 5 \) mm in diameter on the surface of the instruments) which shall be removed by means of an absorbent pad. Then place the instruments upside down on another tray and leave them to dry for at least 30 min but not more than 60 min.
A.8 Test method

A.8.1 Ordinary surgical instruments

Load the WD with the test instruments on their tray and start the WD with a full load. Run the cleaning cycle of the “surgical instrument” program in accordance with the manufacturer’s instructions.

Immediately after the cleaning cycle, interrupt the program and unload the WD.
Introduction to EN15883

How to evaluate instruments according EN15883-5

A.9 Results

- A.9.1 Ordinary surgical instruments
- A.9.1.1 Detection of residual soil

After cleaning in the WD, **examine the instruments visually**. Examine every single instrument by opening and closing box locks and joints. Record the number of clean (no remains of blood visible to the naked eye at normal light with any optical corrections required for normal visual acuity) and not clean instruments.

Calculate the ratio of the test pieces with residual soil to the originally soiled instruments. Express the result in percent.
Introduction to EN15883

How to evaluate instruments according EN15883-5

A.9 Results

- A.9.1 Ordinary surgical instruments
- A.9.1.2 Acceptance criteria

The cleaning efficacy of the WD shall be regarded as satisfactory if

- at least 95% of all test pieces show no visible residue of the test soil,
- the amount of protein on the instruments is below the detection level or within the limits of the acceptance criteria given by the manufacturer of the test as applicable (see also ISO 15883-1:2005, Annex C)

Acc EN15883 = <100μg/instrument
New guideline for automated washing of instruments (2014) = <80ug/instrument
Conclusion

- Validation is setting the standard of the washer disinfector

- A WD has a certain cleaning efficacy that must be measured on soiled instruments before using cleaning indicators

- Only after validation a cleaning indicator should be used to compare the performance of the WD vs the initial validation.

- Therefore there is no pass or fail!
Conclusion

- All commercial cleaning indicators actually on the market contain artificial blood and do not comply to EN15883 and have to be considered as a cleaning “indicator”

- Therefore no validations acc EN15883 shall be done with only commercial cleaning indicators, they can only be used as an indication and can not be the reason to reject a validation

- A reference load for validation should be defined (even when doing a routine check)

- There are more factors then only chemicals that are influencing the final cleaning result

- Position of the indicators should always be positioned on the same place and in the same direction. Be realistic in your expectations
FACTS THAT INFLUENCE THE CLEANING RESULT

\[ f(x) = a + b \] + V_1

\[ \frac{\sqrt{I}}{\sqrt{I+1}} \]

\[ \Theta + [a] + x + 3 \]

\[ sX^2 + a(b) + V_1 \]

\[ sb + [a] + (c) \times 3 \]

\[ N_2 + 3H_2 \Leftrightarrow 2NH_3 \]

\[ CH_3COOH \]

\[ \sqrt{ab} (c) \times 2 + 3 \]

\[ CH_3COO \]

\[ X^2 + 3 (c) + ab \]

\[ H_2SiO_3 \]

\[ sb + [a] + (c) \times 3 \]

\[ mA + nB \Leftrightarrow pC + aD \]
Facts the influence the cleaning result

Conclusion if the cleaning indicators fail you can influence the cleaning result by:

- Change water type or mix
- Change water quality
- Change cleaning temperature
  - Can vary from 45°C to 60°C
  - When > temperature; test Alu and other soft metals
- Change dosing moment
  - Can be from the beginning or can be as of 35°C
- Change cycle time
- Check the (over) load
- Change the product/dosing

ECOLAB®
Check list to optimize cleaning result
Facts the influence the cleaning result

Video’s:  https://www.youtube.com/watch?v=3OdCT2VbHa4  
https://www.youtube.com/watch?v=1BhlRIRnW_s
Facts when using cleaning indicators

A cleaning indicator should always be positioned on the same place and with the same load. Put 5 indicators on each level of your trolley. If you have a worse result than the initial audit, please check water quality, cleaning pressure and correct product dosing!
Facts when using cleaning indicators

- As mechanical power is one of the most influential factors for your cleaning result, it is recommended to use a pressure data logger.

- This gives you the ability to compare different machines on the market and therefore also their cleaning efficacy.

- It's also useful to use “3M Clean Trace Protein test”
WHAT ARE THE MOST FREQUENTLY USED CLEANING INDICATORS ON THE MARKET?
Different cleaning indicators

Some topics to consider

- Does the customer want to have a cleaning indicator that is 100% clean?

- How hard to clean should a cleaning indicator be?
  - Easy, medium or hard to clean?

- It’s a fact that cleaning indicators react mainly on alkalinity and temperature
Cleaning indicators on the market

Some topics to consider

What is important when using a cleaning indicator?

- It is an indicator, it doesn’t have to be 100% clean but the result should be comparable with the initial test
- Same load for each test cycle
- Same position of the cleaning indicator
- Same process cycle vs previous test
Cleaning indicators on the market

TOSI test
Cleaning indicators on the market

TOSI test

Consists of 3 components:

- **Test Soil**
  - Is chemically engineered to mimic the properties of human blood

- **Stainless steel plate**
  - Is scratched or grooved to replicate the uneven surface of an instrument

- **Transparent plastic holder**
  - Is a holder in an angle providing a gradually more difficult cleaning test from one end to the other.
  - Transparency allows the visual evaluation of the cleaning efficacy
Cleaning indicators on the market

TOSI test

ProFormance™ (TOSI) Interpretation Guide
(place cursor over images for interpretation. Click on for more detail)

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Visually Clean</td>
<td>Minor Fibrin Residue</td>
<td>Fibrin Layer Remains</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor Hemoglobin Residue</td>
<td>Most of Fibrin Layer and Some Hemoglobin</td>
<td>Major Lack of Cleaning</td>
</tr>
</tbody>
</table>
Cleaning indicators on the market

TOSI test

Minor Fibrin Residue
Mechanical spray activity is good, try improving chemical activity by increasing enzyme hold time, raising temp. or raising pH.
Cleaning indicators on the market

TOSI test

Fibrin Layer Remains
Chemical activity is poor, check for lack of enzyme cleaner and/or lack of high pH detergent.
TOSI test

3

Minor Hemoglobin Residue
Chemical activity is good but some obstruction to spray action. Check for overloading or blocked spray arms
Cleaning indicators on the market

TOSI test

Most of Fibrin Layer and Some Hemoglobin
Poor chemical activity and some spray obstruction
Cleaning indicators on the market

TOSI test

Major Lack of Cleaning
Very little activity from both chemical and spray action. Major blockage or cold rinse may be too hot
# Introduction to EN15883

## TOSI®-Troubleshooting Guide: What to do in case of...

<table>
<thead>
<tr>
<th>TOSI Test Results</th>
<th>Rating</th>
<th>Description</th>
<th>Possible Reasons for TOSI Test Results</th>
<th>Immediate corrective action (to be conducted by CSSD personnel)</th>
<th>Proposal for optimisation of relevant process parameters (typically requires Service Engineer)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Optimum Result</td>
<td>Test is completely disinfected, no test and residual seen</td>
<td>Optimum result</td>
<td>not necessary</td>
<td>not necessary</td>
</tr>
<tr>
<td>1</td>
<td>Negative Result 1</td>
<td>TOSI is completely mixed, no water soluble products visible, but large amount of film visible</td>
<td>a) Incorrectly positioned or blocked TOSI b) Cleaning time too short c) Temperature too high d) Dose of detergent too low</td>
<td>a) Report test protocol with small load b) Investigate cleaning time c) Investigate cleaning temperature d) Check dissolution of detergent</td>
<td>a) Consider other possible reasons b) Adjust cleaning time to type of detergent or extended time c) Adjust cleaning temperature to type of detergent d) Increase dosage</td>
</tr>
<tr>
<td>2</td>
<td>Negative Result 2</td>
<td>TOSI is completely mixed, no water soluble products visible, but light or all of the film layer visible</td>
<td>a) Incorrectly positioned or blocked TOSI b) Overloading/incorrect loading c) Temperature too high d) Insufficient detergent efficiency</td>
<td>a) Report test protocol with small load b) Investigate cleaning time c) Investigate cleaning temperature d) Check dissolution of detergent e) Check storage conditions and expiry date of detergent</td>
<td>a) Consider other possible reasons b) Adjust cleaning time to type of detergent or extended time c) Adjust cleaning temperature to type of detergent d) Increase dosage or replace detergent e) Replace incorrectly stored or expired detergent</td>
</tr>
<tr>
<td>3</td>
<td>Negative Result 3</td>
<td>TOSI is incompletely mixed, no water soluble [red] portions are visible, some or only a small amount of the film layer visible</td>
<td>a) Incorrectly positioned or blocked TOSI b) Overloading/incorrect loading c) Insufficient detergent d) Temperature too high e) Insufficient detergent efficiency f) Insufficient detergent efficiency</td>
<td>a) Report test protocol with small load b) Investigate cleaning time c) Investigate cleaning temperature d) Check dissolution of detergent e) Check storage conditions and expiry date of detergent</td>
<td>a) Consider other possible reasons b) Adjust cleaning time to type of detergent or extended time c) Adjust cleaning temperature to type of detergent d) Increase dosage or replace detergent e) Replace incorrectly stored or expired detergent</td>
</tr>
<tr>
<td>4</td>
<td>Negative Result 4</td>
<td>TOSI is completely mixed, no water soluble [red] portions are visible, in addition, or no or all of the film layer visible</td>
<td>a) Same as rating 3 but more distinct b) Defective pump c) Loss of pressure or other defect d) Insufficient detergent e) Insufficient detergent efficiency f) Insufficient detergent efficiency</td>
<td>a) Same as rating 3 b) Refer to Service Engineer c) Check pressure and each connection d) Investigate cleaning temperature e) Check storage conditions and expiry date of detergent</td>
<td>a) Same as rating 3 b) Refer to Service Engineer c) Check pressure and each connection d) Investigate cleaning temperature e) Check storage conditions and expiry date of detergent</td>
</tr>
<tr>
<td>5</td>
<td>Negative Result 5</td>
<td>TOSI is not a large or completely unaffected</td>
<td>a) Same as rating 4 b) Insufficient cleaning time and/or inadequacy of the water and/or detergent</td>
<td>a) Same as rating 4 b) Insufficient cleaning time and/or inadequacy of the water and/or detergent</td>
<td>a) Same as rating 4 b) Insufficient cleaning time and/or inadequacy of the water and/or detergent</td>
</tr>
</tbody>
</table>

### Recommended Cleaning Parameters [please refer to specifications of manufacturer]

<table>
<thead>
<tr>
<th>Type of Detergent</th>
<th>Concentration</th>
<th>Cleaning Time</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkaline detergent</td>
<td>5 g/litre</td>
<td>5 min</td>
<td>60°C</td>
</tr>
<tr>
<td>Neutral detergent with enzymes</td>
<td>5 g/litre</td>
<td>10 min</td>
<td>60°C</td>
</tr>
<tr>
<td>Neutral detergent without enzymes</td>
<td>1-3 g/litre</td>
<td>10 min</td>
<td>60°C</td>
</tr>
</tbody>
</table>

### Important Note

In case of unanticipated test results, these results should be confirmed by running the test program with a smaller load. In case of confirmation or a new issue, it is necessary to investigate potential issues for the future. In case the issue of a failure cannot be resolved by the CSSD, the technical support of the detergent manufacturer should be contacted. It is not recommended to change any isolated parameters in such circumstances to the technical support of the supplier, as this might result in a loss of warranty!
Introduction to EN15883

TOSI test  https://www.youtube.com/watch?v=-b5sv6PGw0M
https://www.youtube.com/watch?v=2MDcR7PFSb8
Introduction to EN15883

Verify All Clean Test Washer Indicator

The VERIFY All Clean Test Washer Indicator - a consistent, reproducible method to routinely check the performance of your automated washing process.
Introduction to EN15883

Verify All Clean Test Washer Indicator

Features and benefits

- **No blood products** - Safe-to-handle, safe-to-place in your washer/disinfector, no toxic residuals on instruments
- **Consistent formulation** - Reproducible testing, time after time
- **Bright red test soil formula** - Easy-to-see, easy-to-interpret
- **Stainless steel holder** - Corrosion and abrasion resistant
- **Mesh design holder** - Mimics typical surfaces to present a realistic challenge
- **Lot number on end of strip** - Provides traceability
Introduction to EN15883

Verify All Clean Test Washer Indicator

1. Materials

- All Clean Test Washer Indicator Holder
- All Clean Test Washer Indicator
- Automated Washer/Disinfector

Adobe Acrobat Document
Introduction to EN15883

Verify All Clean Test Washer Indicator

2 Procedures

Make sure the holder is clean and dry. Insert indicator into holder.

Centrally place the holder with indicator into a wire basket. Orientation of the holder should be placed with one of the soil stains flat (facing down) on the wire basket and the other soil stain oriented vertically. (see image above)

To establish a control, place empty basket with holder into a rack for processing at the beginning of each day. Level of rack and/or number of racks used to be determined by customer.
Introduction to EN15883

Verify All Clean Test Washer Indicator

3 Results

After running a complete cycle, remove the device from the tray or basket and carefully remove the VERIFY All Clean Test Indicator from the holder. Inspect the indicator for evidence of soil by placing the plastic film against a white background. Compare the results against the samples below to determine the cause of action. If the indicator remains visible to the naked eye - the result is a FAIL.

- **Unused**
- **Impingement Related Failure**
  1. Incorrect positioning of indicator
  2. Blocked spray arms
  3. Lack of water pressure
  4. Overloading of rack
- **Chemistry Related Failure**
  1. Incorrect positioning of indicator
  2. Enzyme and/or wash phase is too short
  3. Temperature parameters are not correct
  4. Chemistry injection rates are not correct

Pass
Introduction to EN15883

Wash-Checks Steritec
Introduction to EN15883

Wash-Checks Steritec

- Designed to monitor the wash/detergent system effectiveness with a consistent monitor on a routine basis.

- If insufficient time, temperature, detergent concentration, spray arm function or enzyme soak occurs, a red residue remains.

- Test soil is designed to parallel the removal of blood and tissue from surgical instruments.

- No actual blood components from any source are contained in the test soil.

- Low cost monitor promotes routine use.
We recommend monitoring each shelf of every washer each day for a machine release and using a minimum of one Wash-Check monitor per load when the washer has proven effective.

Use with reusable Wash-Checks holder (WC 102), that acts as a hinged instrument measuring impingement.

Third party testing has proven Wash-Checks to be the most reliable and effective wash monitor on the market (Austrian Association of Sterile Supply).
**Introduction to EN15883**

Wash-Checks Steritec

**INTERPRETATION**

- **Unexposed**
  - The red spot will disappear when proper washing conditions have been met

- **Pass**
  - Detergent Chemistry: Good
  - Impingement: Good

- **Fail**
  - Detergent Chemistry: Medium
  - Impingement: Good

- **Fail**
  - Detergent Chemistry: Weak
  - Impingement: Good

- **Fail**
  - Detergent Chemistry: Medium
  - Impingement: Weak

- **Fail**
  - Detergent Chemistry: Weak
  - Impingement: Good

**Wash family common failures:**
- Inadequate water spray/impingement
- Clogged spray arms
- Overloading
- Instrument shadowing
- Inadequate detergent dosing
- Improper detergent dosing
- Faulty peristaltic pumps
- Poor water quality
Introduction to EN15883

Wash-Checks Steritec
https://www.youtube.com/watch?v=yUExWA-KTVRI
Technology + People = Knowledge
\[ x^2 + 3(c) + ab \]
\[ f(x) [a+b] + V_i \]
\[ \sqrt{ab} (c) x^2 + 3 \]
\[ f = -0.5 z^2 \frac{\sqrt{I}}{\sqrt{I+1}} \]
\[ 3 + f(x) + V_i \]
\[ \Theta + [a] x + 3 \]
[Image 22x17 to 141x39]
[Image 431x367 to 581x386]
[Image 32x484 to 176x508]
[Image 496x467 to 638x500]
[Image 31x369 to 193x394]
[Image 261x480 to 423x512]
[Image 547x394 to 685x451]
[Image 234x366 to 379x389]
[Image 335x413 to 470x449]
[Image 97x409 to 258x478]
[Image 41x142 to 184x163]
[Image 106x68 to 177x93]
[Image 354x108 to 446x167]
[Image 493x114 to 637x138]
[Image 427x65 to 626x91]
[Image 178x107 to 320x140]
[Image 235x68 to 385x88]
[Image 548x149 to 690x177]

THANK YOU FOR YOUR ATTENTION

Video link

[Image 46x224]