Think hygienic production – design is everything

Director Food Safety, Lene Meinert, PhD

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Hygienic production

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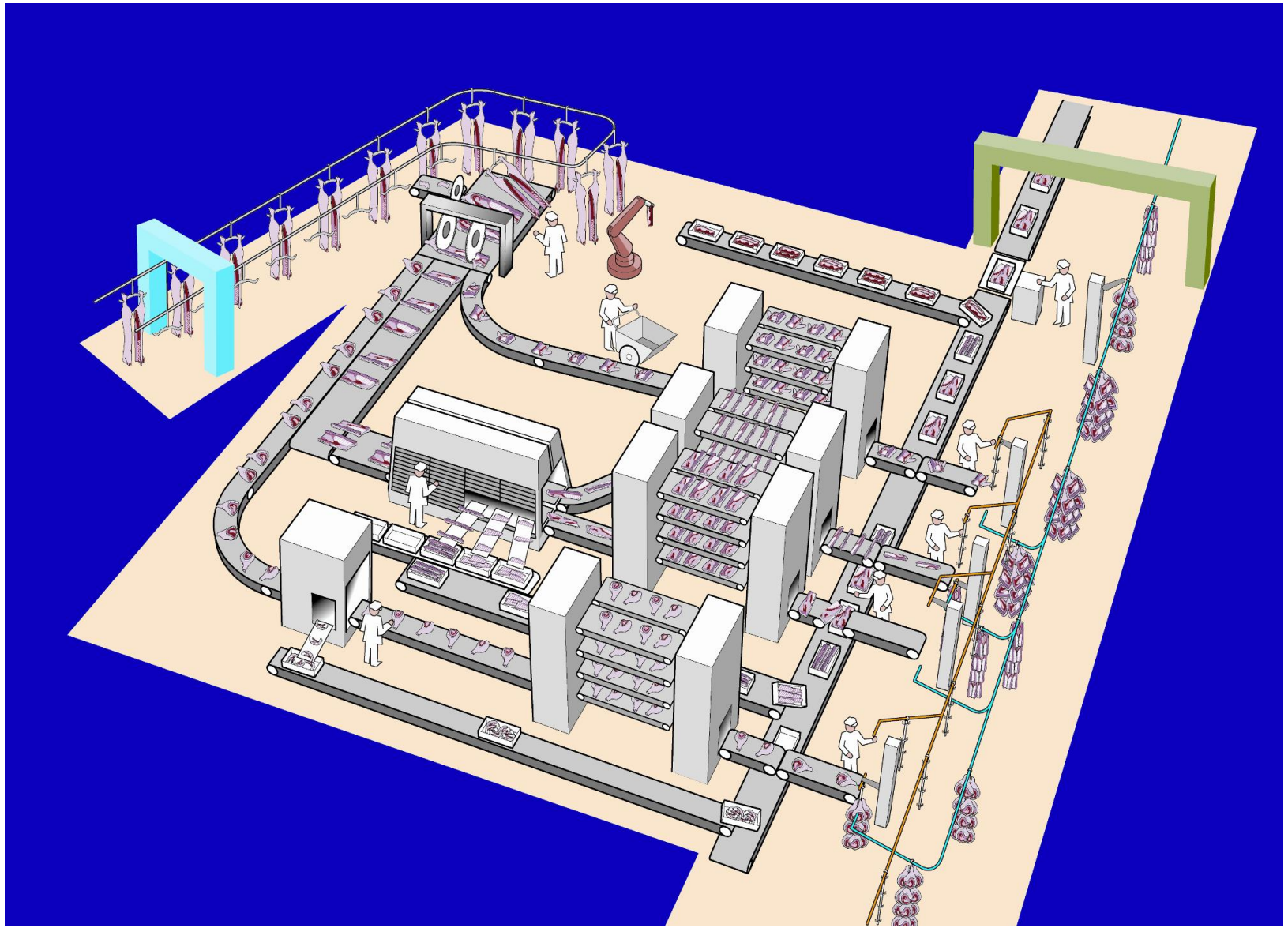

NO! Mindset

Focus on the technological solution, then…

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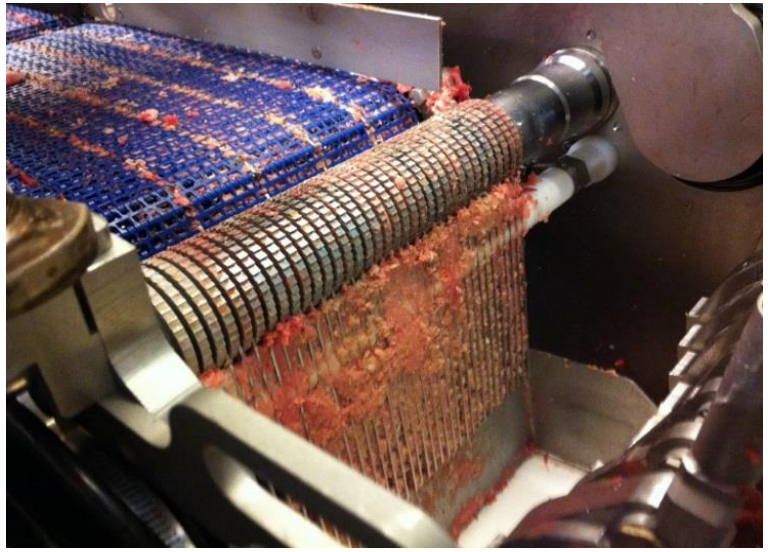

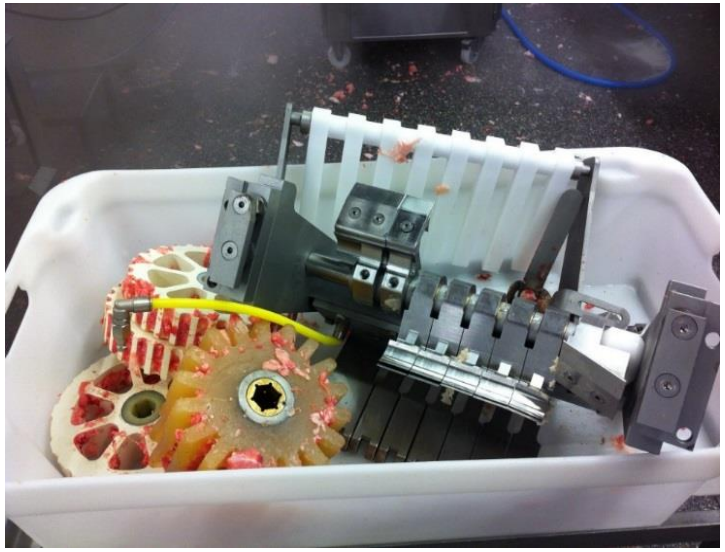

One way to do it:

DMRI test of prototype

- Stop/test
- Refine the design
- Lessons learned

3D derinding machine for loins

Good hygienic design

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- Ensures good cleaning of the equipment
- Decreases the risk of growth and contamination of (harmful) microorganisms
- Promotes good production hygiene, which is the cornerstone of food safety

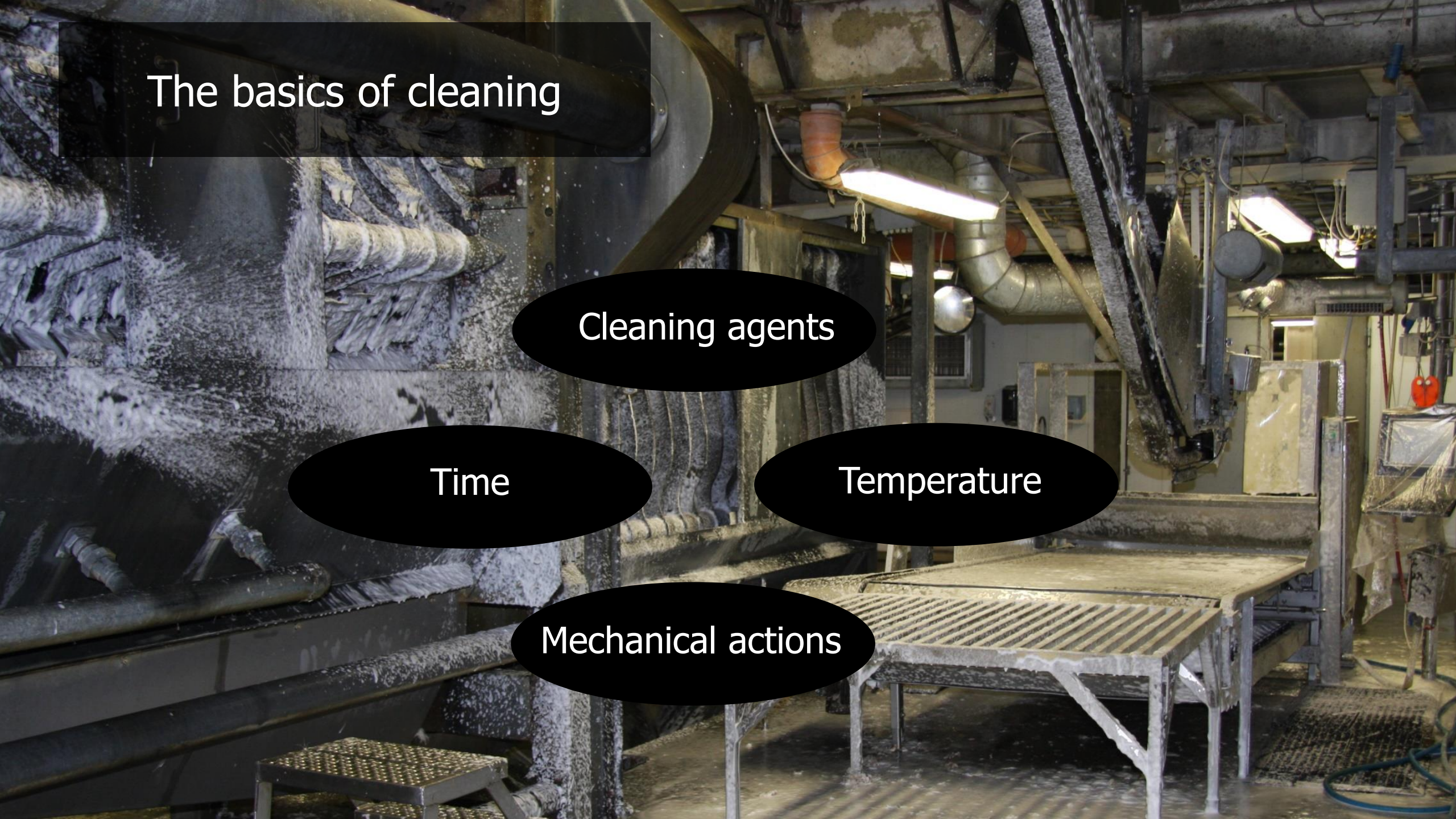
Cleaning is not just about food safety

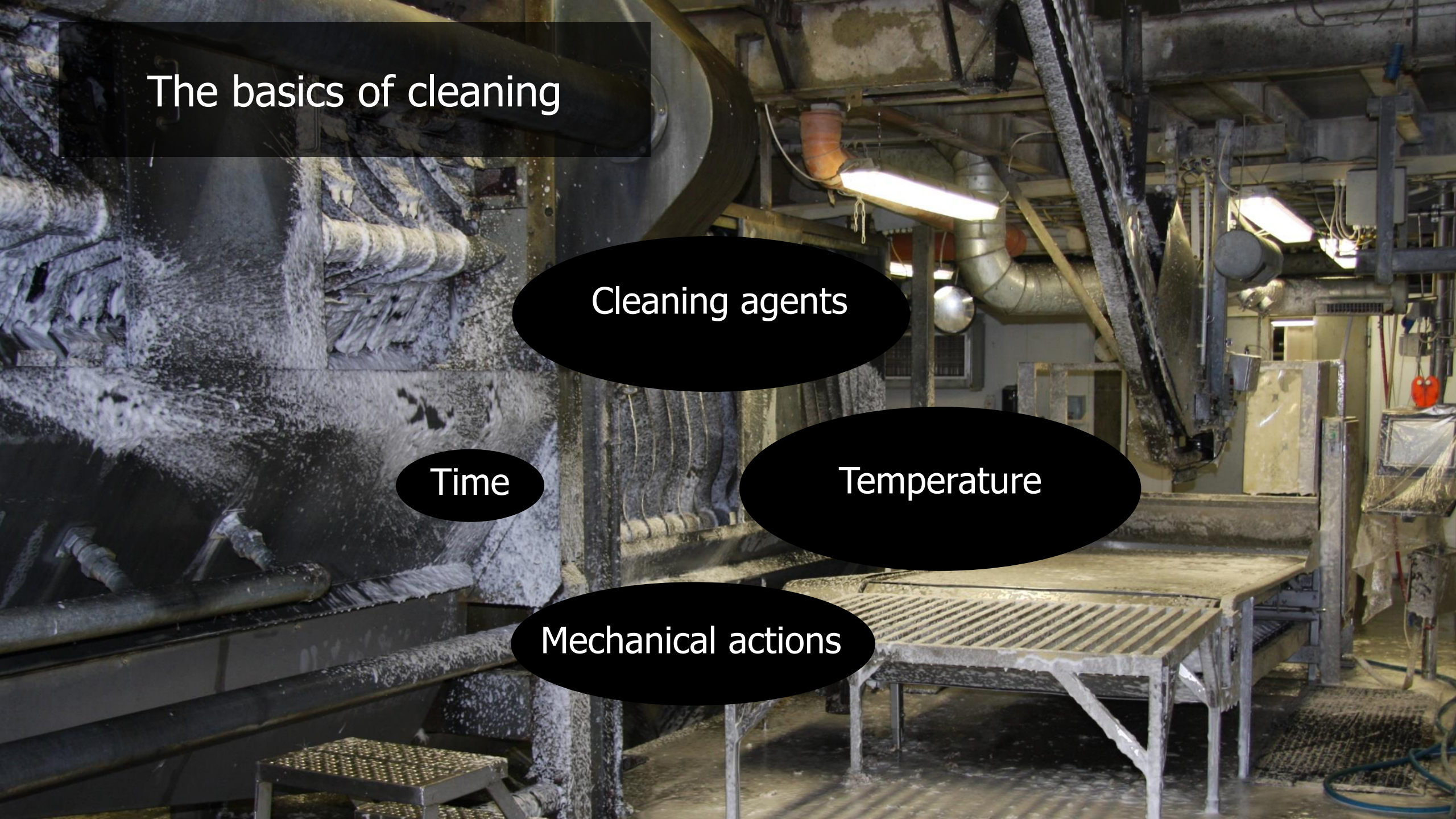
- Shelf life (global export)

BUT

- Costs: Money as well as time

  37 million €/year in the Danish meat industry
- Equipment: Wears out and breaks down
- Environment - water and chemicals


The basics of cleaning
Cleaning agents
Time
Temperature
Mechanical actions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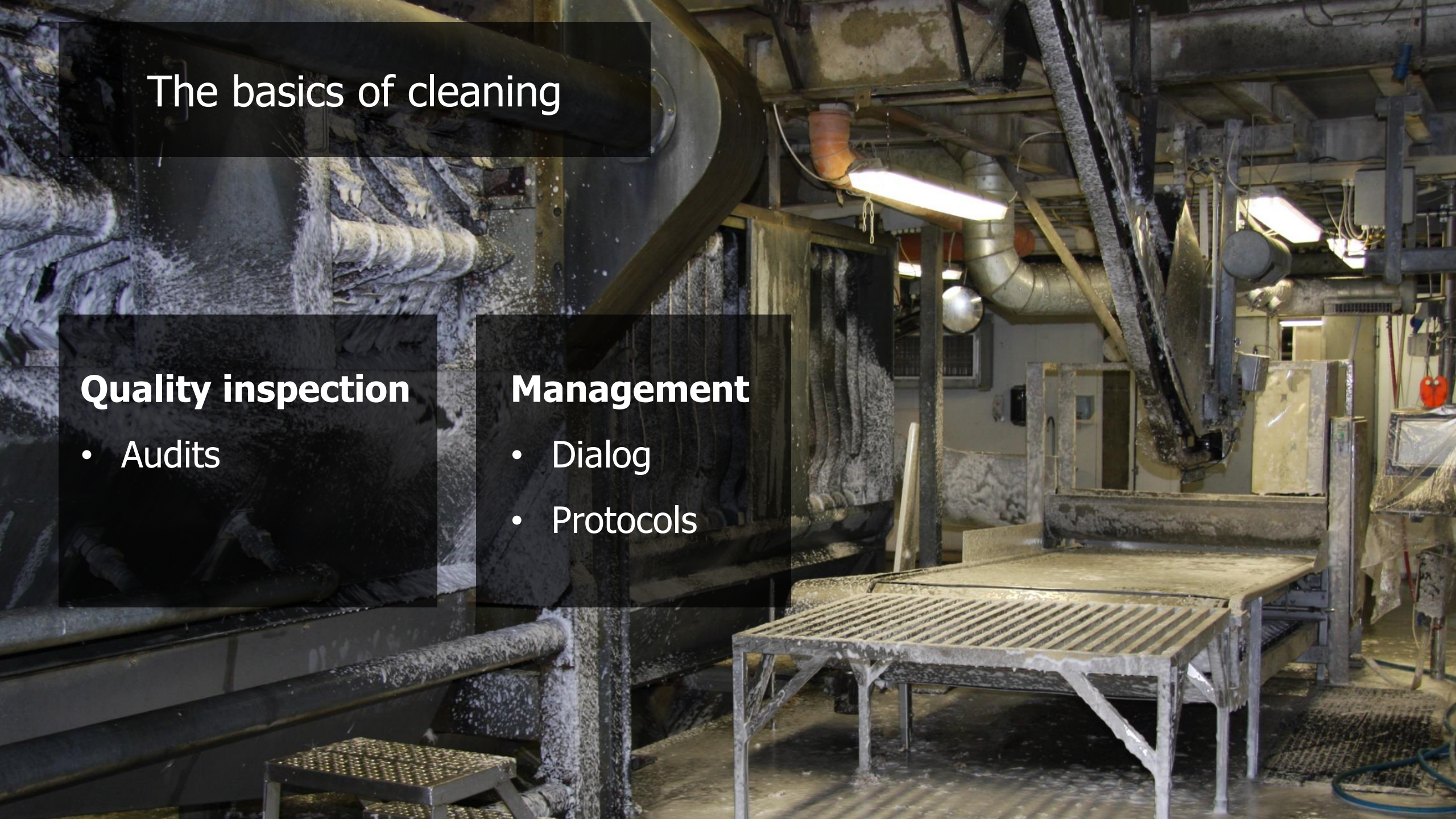
The basics of cleaning

Quality inspection

- Audits

Management

- Dialog
- Protocols



Cleaning by tradition

Interesting

Production efficiency throughout the production line is continuously optimised – not cleaning

Is it due to

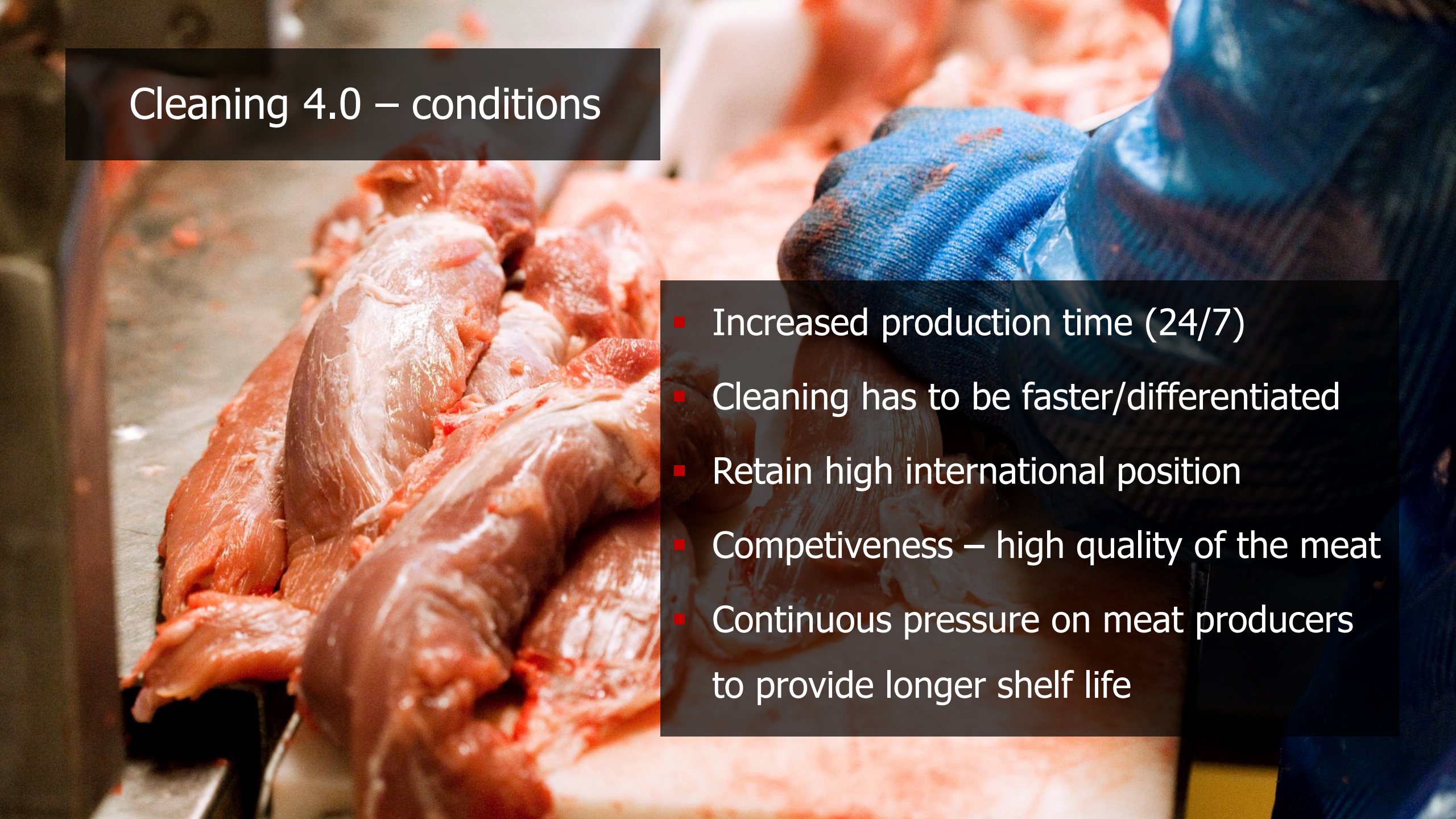
Legislation?

Customers?

Traditional cleaning and disinfection in the meat industry for years

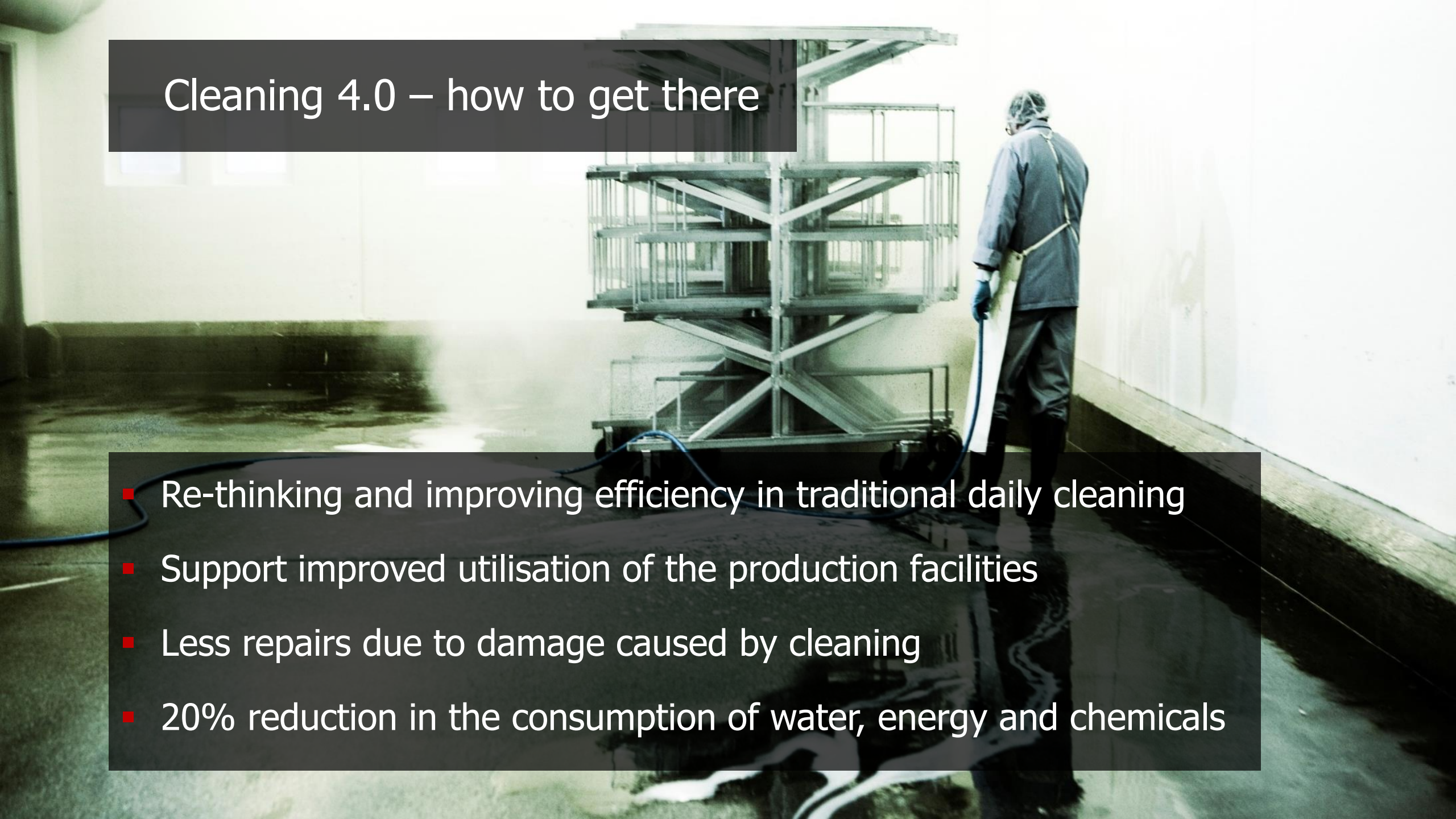
1. Prepare equipment for cleaning
2. Initial rinsing/scrubbing
3. Foam
4. Rinsing
5. Disinfection
6. Rinsing
7. Drying (time and energy)

Cleaning 4.0 – conditions



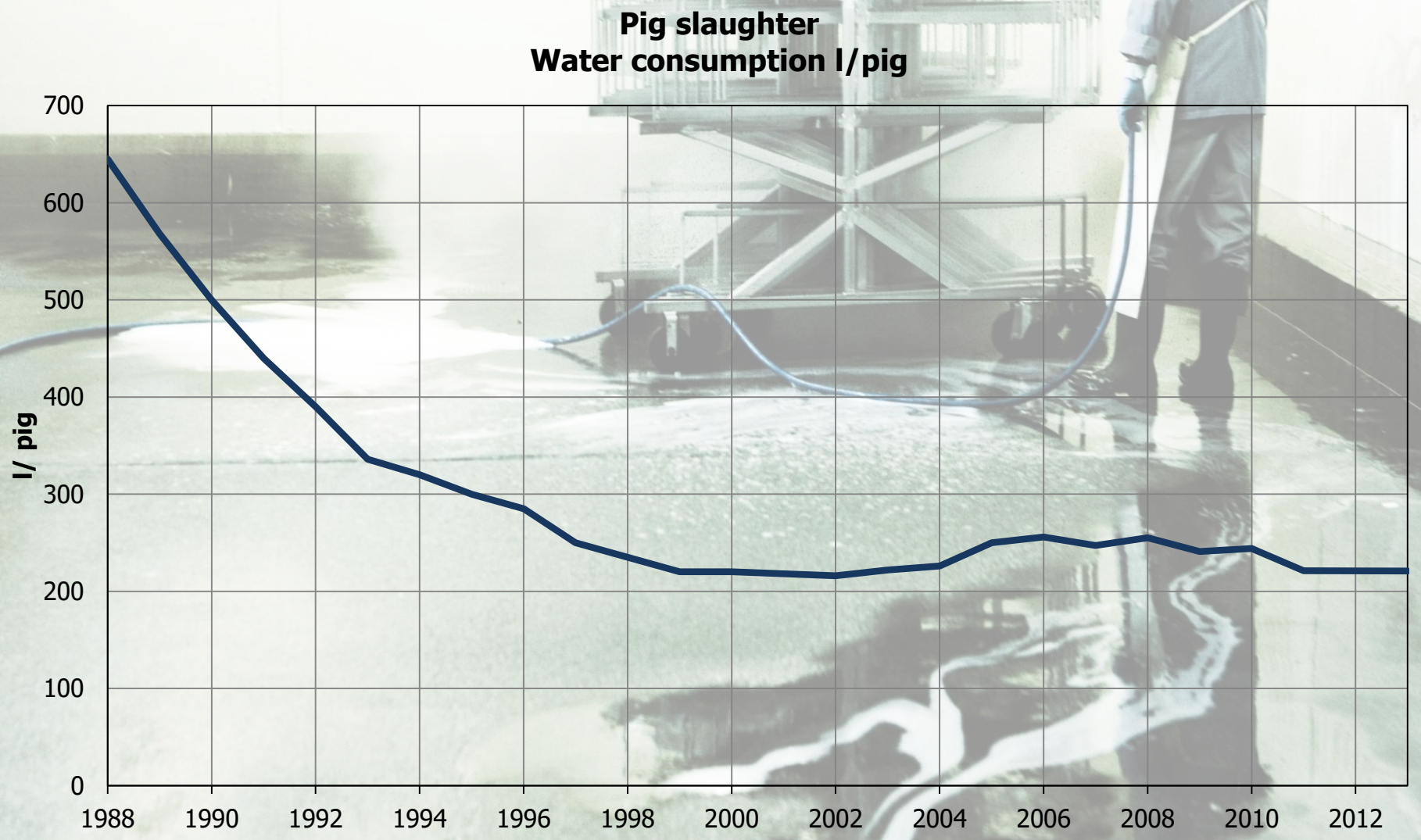
- Increased production time (24/7)
- Cleaning has to be faster/differentiated
- Retain high international position
- Competiveness – high quality of the meat
- Continuous pressure on meat producers to provide longer shelf life

Cleaning 4.0 – how to get there

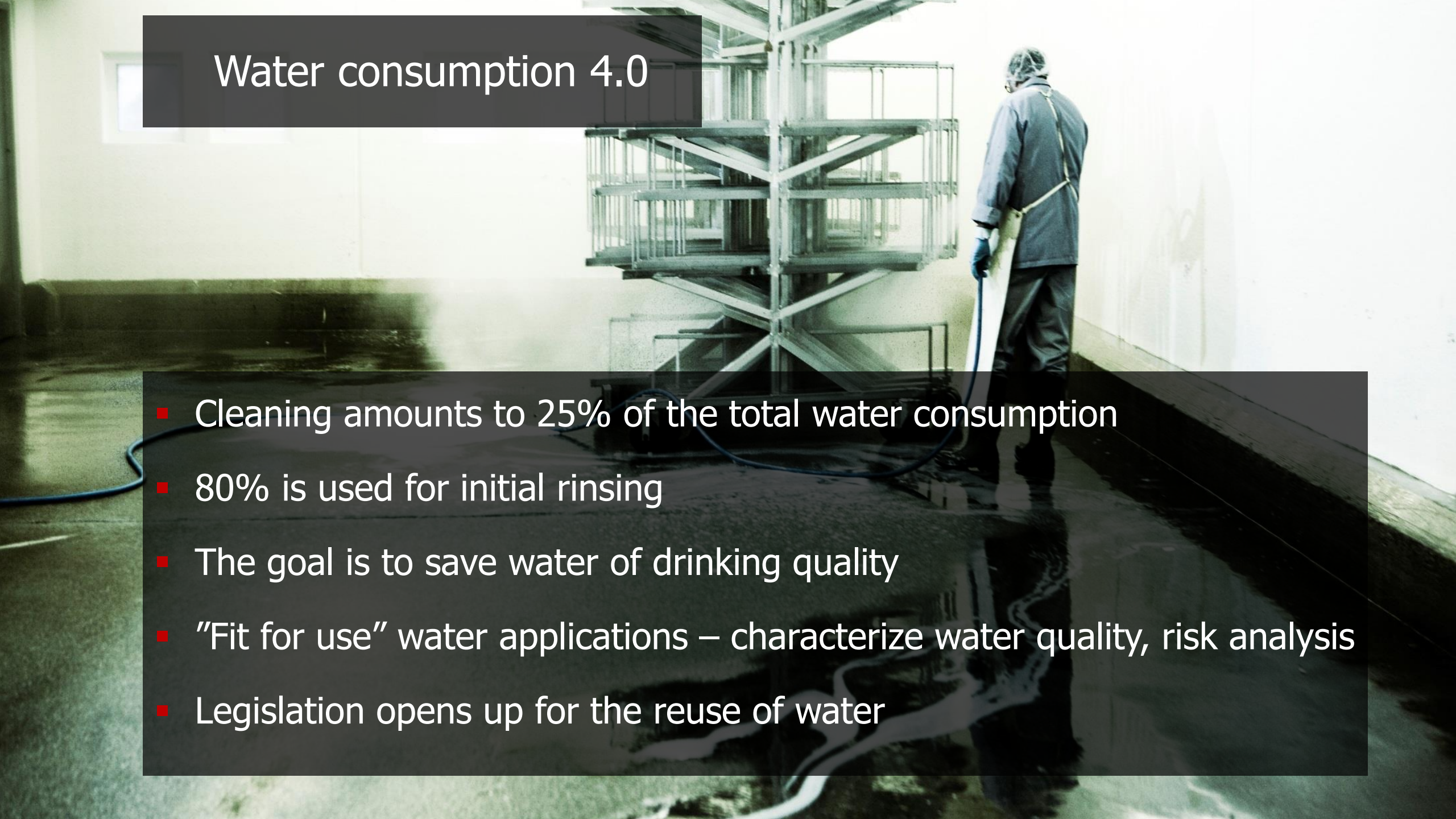


- Re-thinking and improving efficiency in traditional daily cleaning
- Support improved utilisation of the production facilities
- Less repairs due to damage caused by cleaning
- 20% reduction in the consumption of water, energy and chemicals

Water consumption today



Water consumption 4.0



- Cleaning amounts to 25% of the total water consumption
- 80% is used for initial rinsing
- The goal is to save water of drinking quality
- ”Fit for use” water applications – characterize water quality, risk analysis
- Legislation opens up for the reuse of water


DMRI ideas and results

It needs to look clean, and it needs to work

Disinfection of knives without chemicals

Water system:

- Initial rinsing at 42°C
- Sterilize at 82°C
- Final rinse (cooling) at 42°C

It needs to look clean, is coating the answer?

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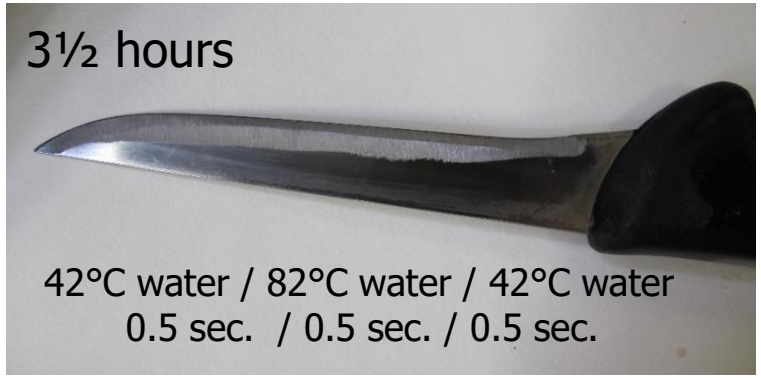

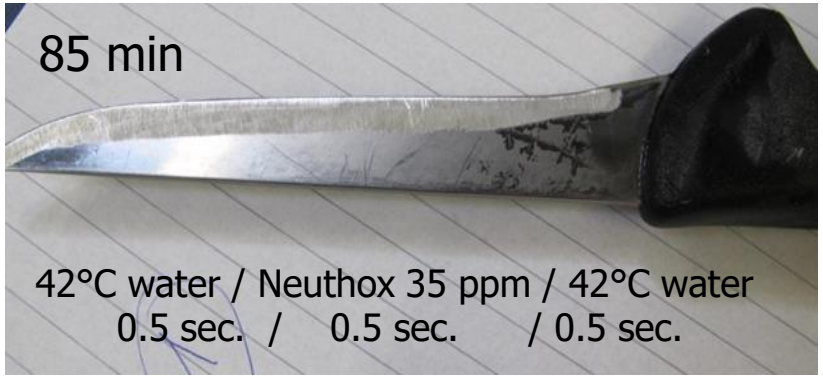

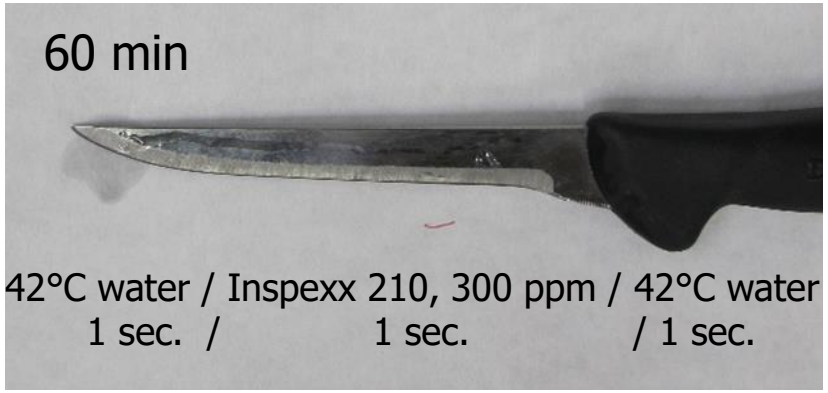

It needs to look clean

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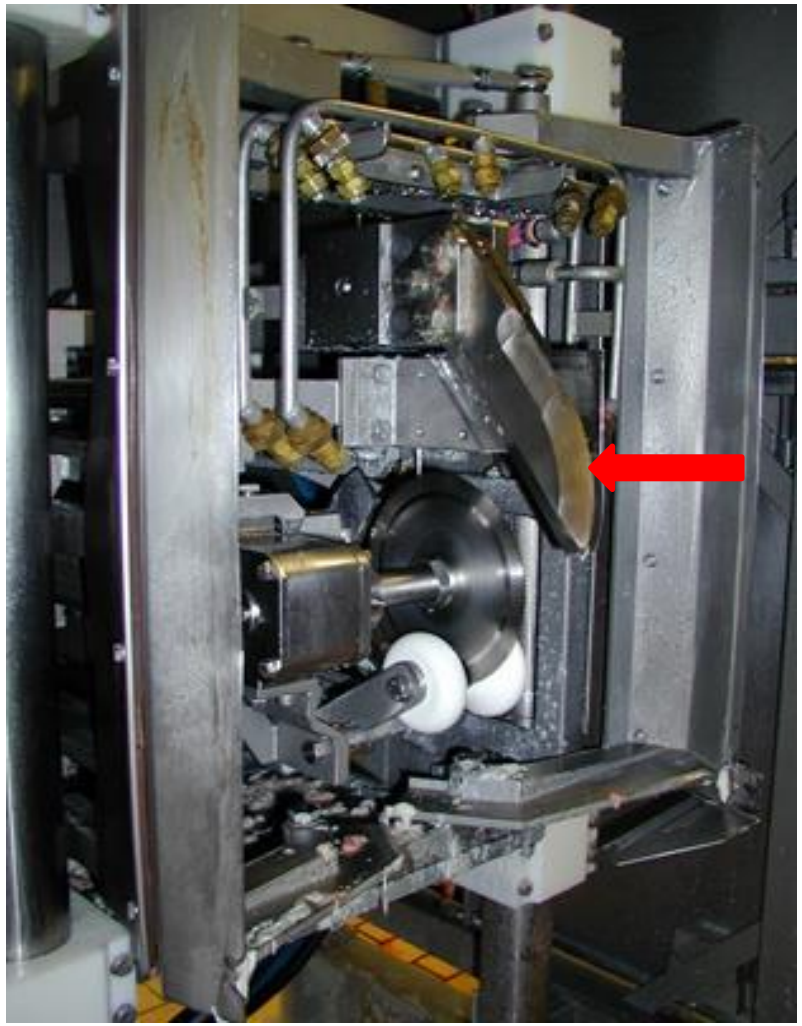
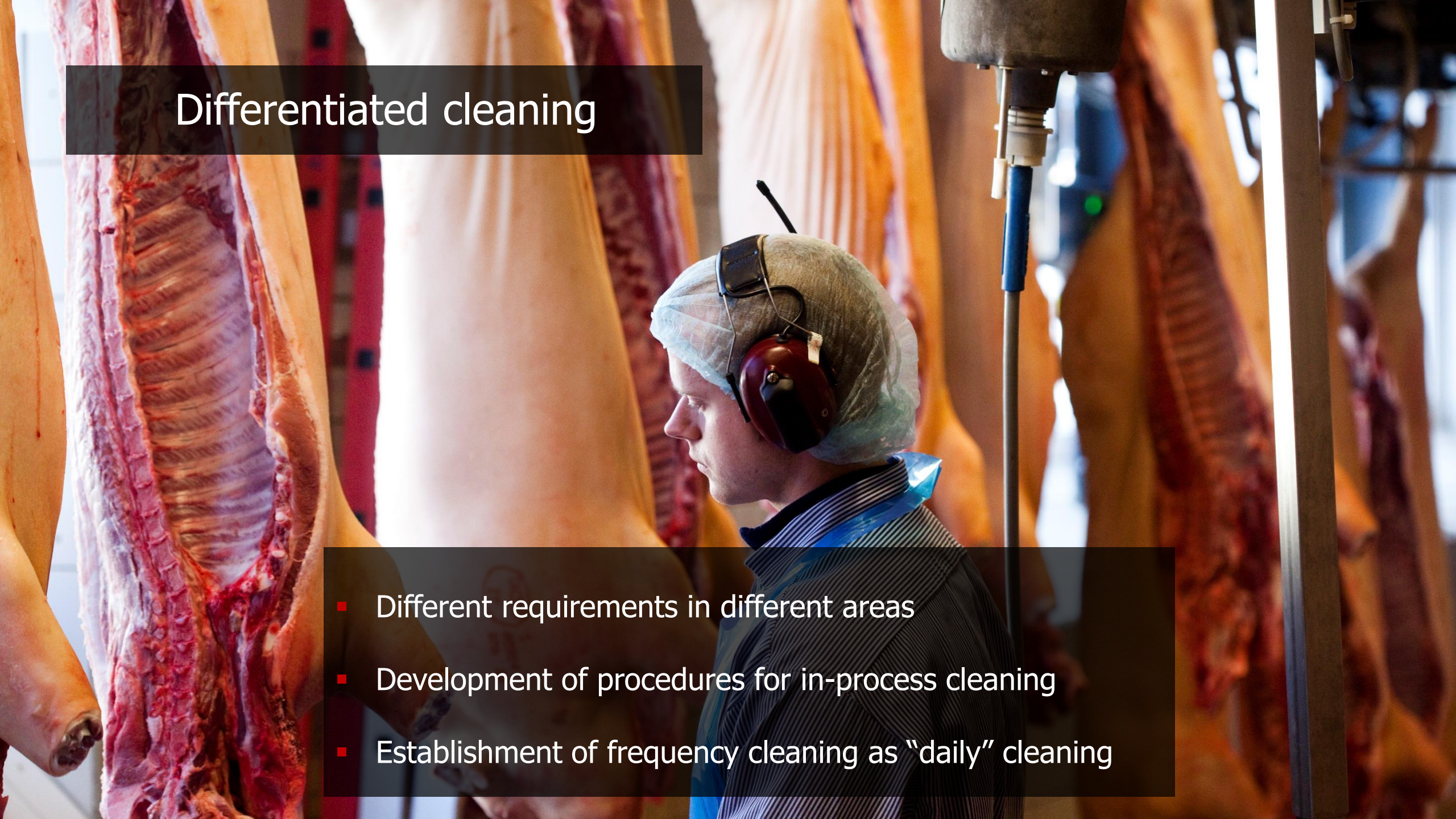


Sterilise with 82°C hot water

- Rinse with water at 42°C
- Sterilise with 82°C hot water
- Chill with water at 42°C

Robot for loosening the backbone

Differentiated cleaning



- Different requirements in different areas
- Development of procedures for in-process cleaning
- Establishment of frequency cleaning as “daily” cleaning

Frequency cleaning

- In-process cleaning
- Cleaning of critical spots
- Simple removal of meat residues
- Wiping surfaces

Daily cleaning – microbial baseline

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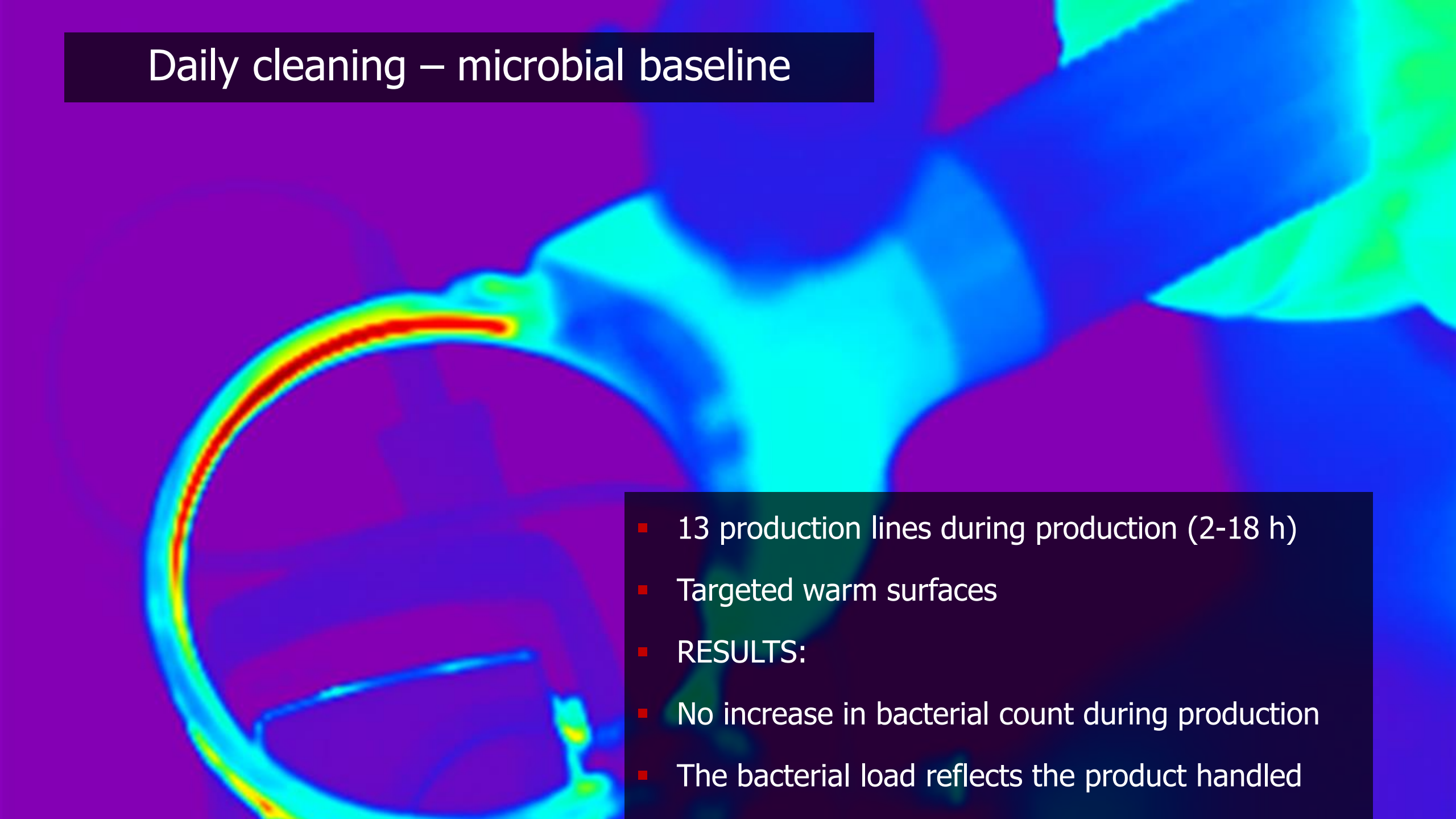
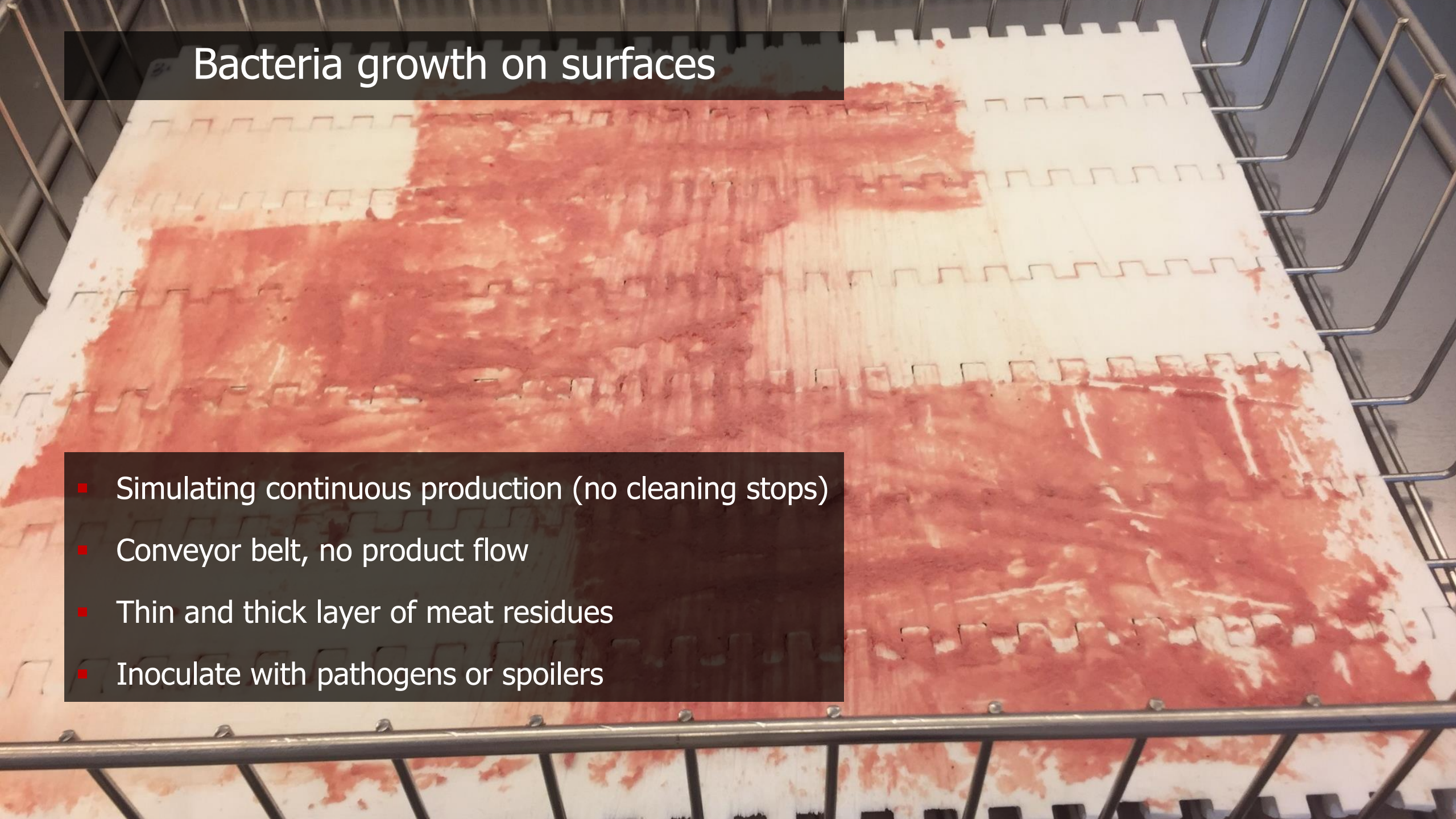
Wizard knife - trimmings

Daily cleaning – microbial baseline



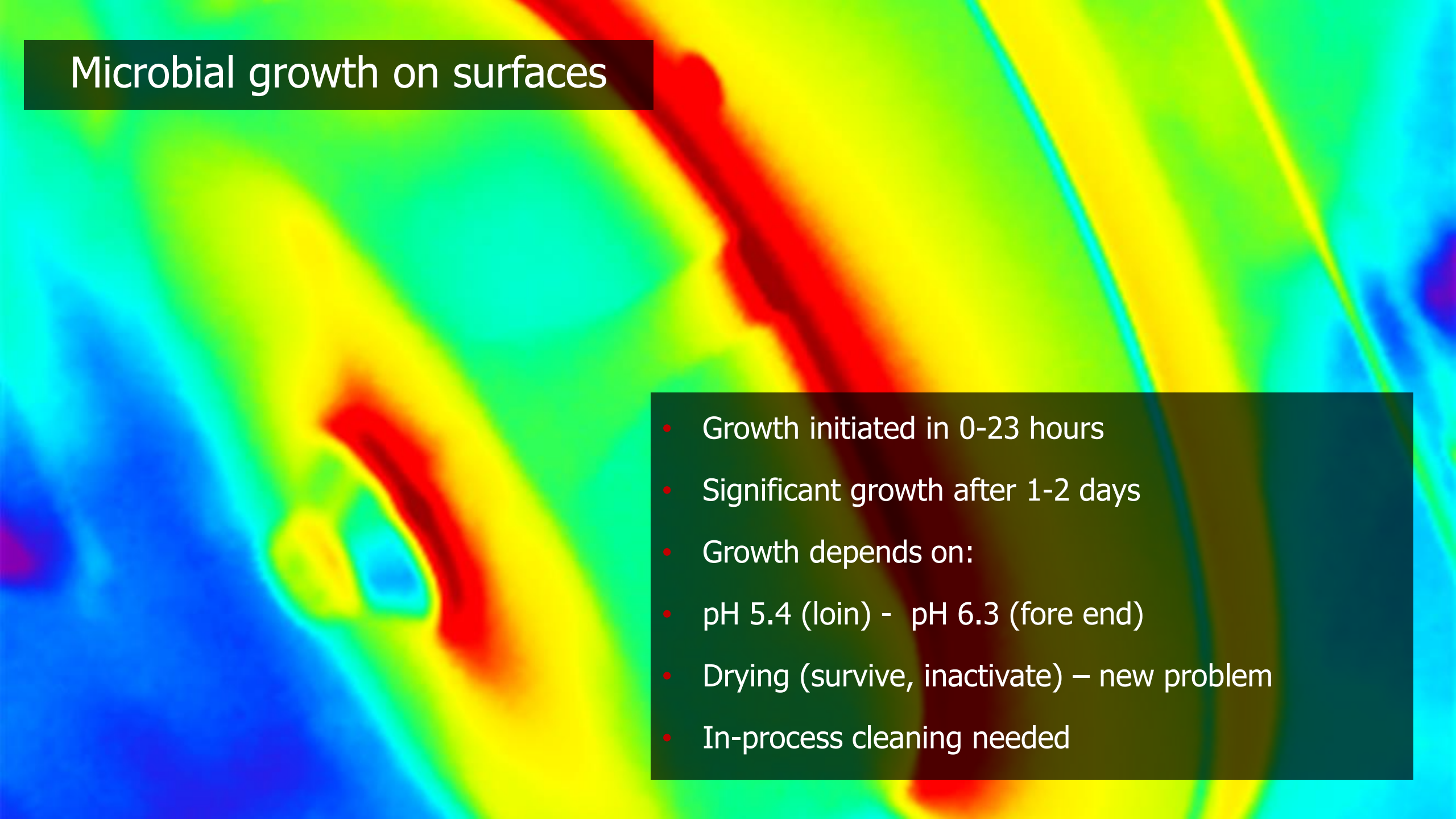
- 13 production lines during production (2-18 h)
- Targeted warm surfaces
- RESULTS:
- No increase in bacterial count during production
- The bacterial load reflects the product handled

Bacteria growth on surfaces



- Simulating continuous production (no cleaning stops)
- Conveyor belt, no product flow
- Thin and thick layer of meat residues
- Inoculate with pathogens or spoilers

Microbial growth on surfaces



- Growth initiated in 0-23 hours
- Significant growth after 1-2 days
- Growth depends on:
- pH 5.4 (loin) - pH 6.3 (fore end)
- Drying (survive, inactivate) – new problem
- In-process cleaning needed

Production time and shelf life of cooked meat products

Simulating continuous production – effect of bacteria count

- Sampling of cooked meat during a production of 100 h
- Normal procedure: cleaning surfaces during production (IPA-cloth)
- Test of frequency cleaning on critical spots

Production time and shelf life

Using frequency cleaning

- Significantly reduced the number of bacteria naturally present on the meat at the time of packing
- Provided extended shelf life

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Process control – the future

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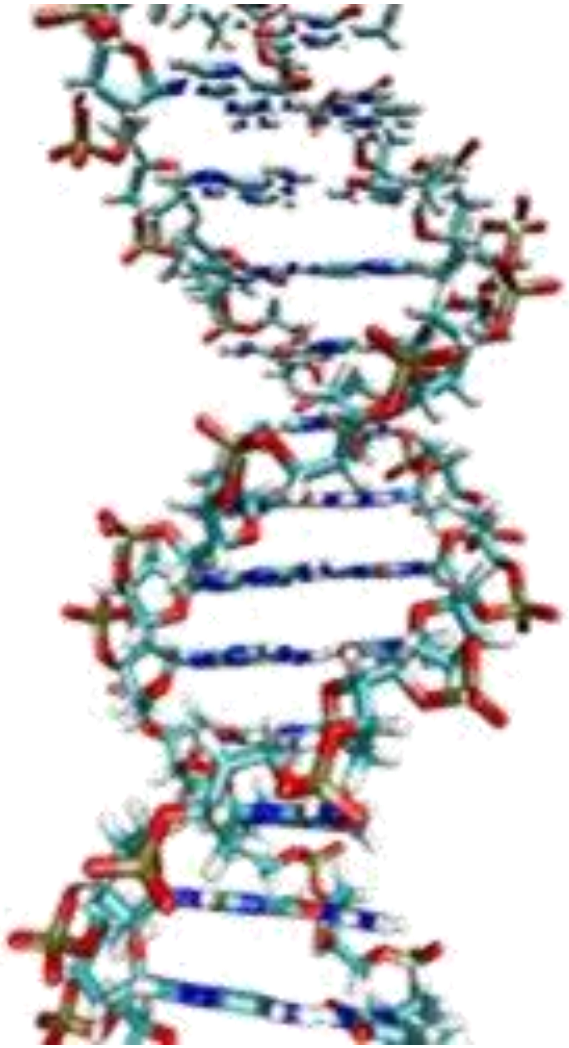
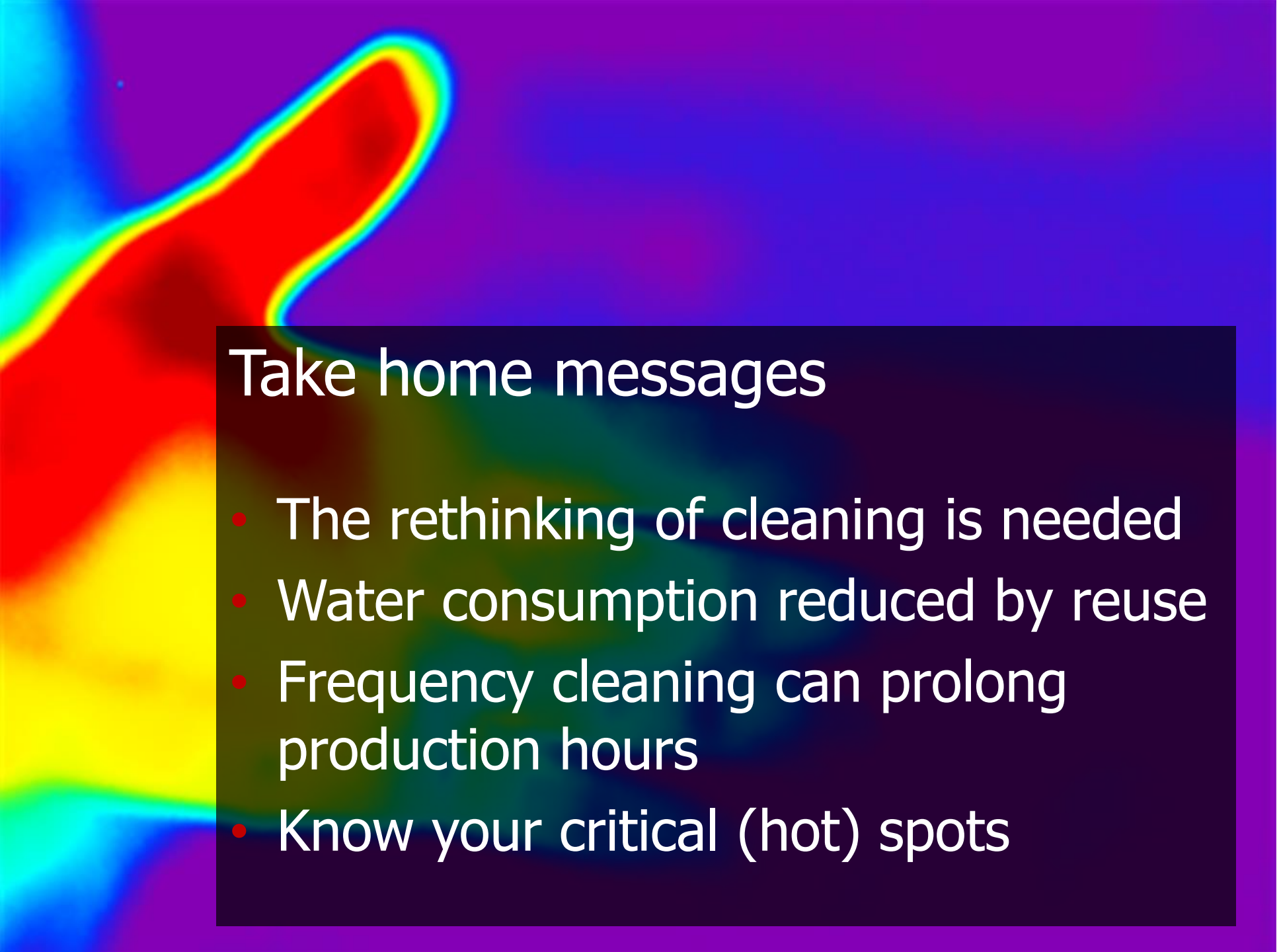


Perspectives

- Identify routes of contamination (spoilage 16S, pathogens WGS)
- Bacterial make-up in production environment and products (16S)
- Control the process (e.g. fermentation)



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Take home messages

- The rethinking of cleaning is needed
- Water consumption reduced by reuse
- Frequency cleaning can prolong production hours
- Know your critical (hot) spots


Thank you for your attention
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