

MINIMIZE BIOFILMS BY DESIGN

Reducing your risks and managing biofilms in
your facilities

3A SSI Educational Program
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Dave Blomquist
DFB Consulting
651-324-6158
dave@dfbconsult.com



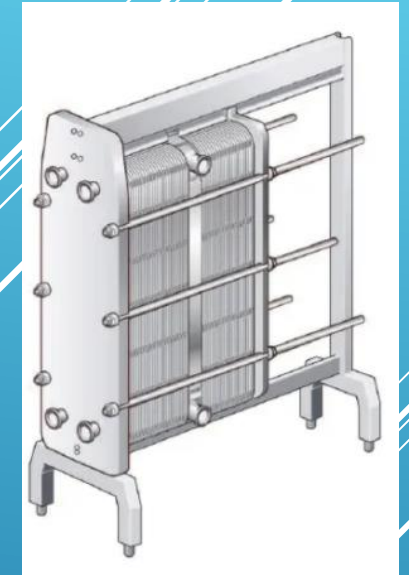
MINIMIZE BIOFILMS BY DESIGN

The most difficult microorganisms to remove are those that are embedded in a biofilm. **The best way to address biofilms is to prevent them.**



BIOFILM BASICS

- Biofilm formation begins in 8 hours
- Conventional cleaning may not remove the biofilm
- They form in low flow areas where bacteria can multiply:
 - Pasteurizers
 - Separators
 - Evaporators
 - Gaskets



HOW DO YOU DETECT A BIOFILM?

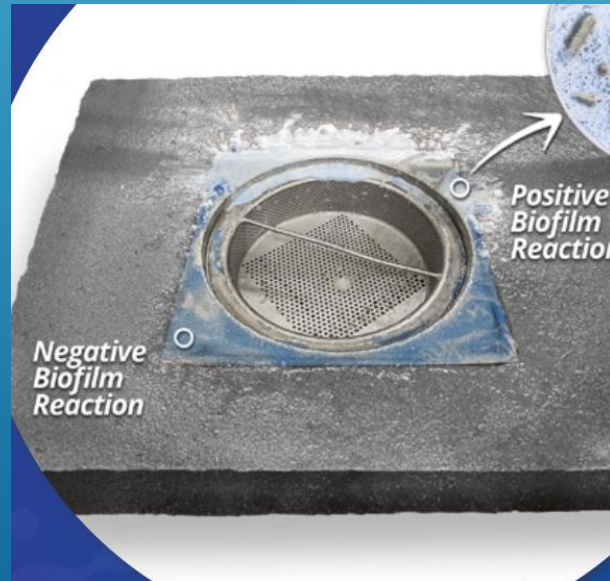
- ATP

Sample Source	ATP – RLU
1. Conveyor in photo	151967
1. Re-cleaned with manual cleaner	768
1. 2 nd recleaning with manual cleaner	0
1. Cleaned caustic based foam cleaner plus chlorine	1253
1. Repeat cleaning using caustic based foam and chlorine	0



HOW DO YOU DETECT A BIOFILM?

- ATP
- Indicator Gel – Bubbles in the presence of Biofilm



Photos courtesy of Sterilex



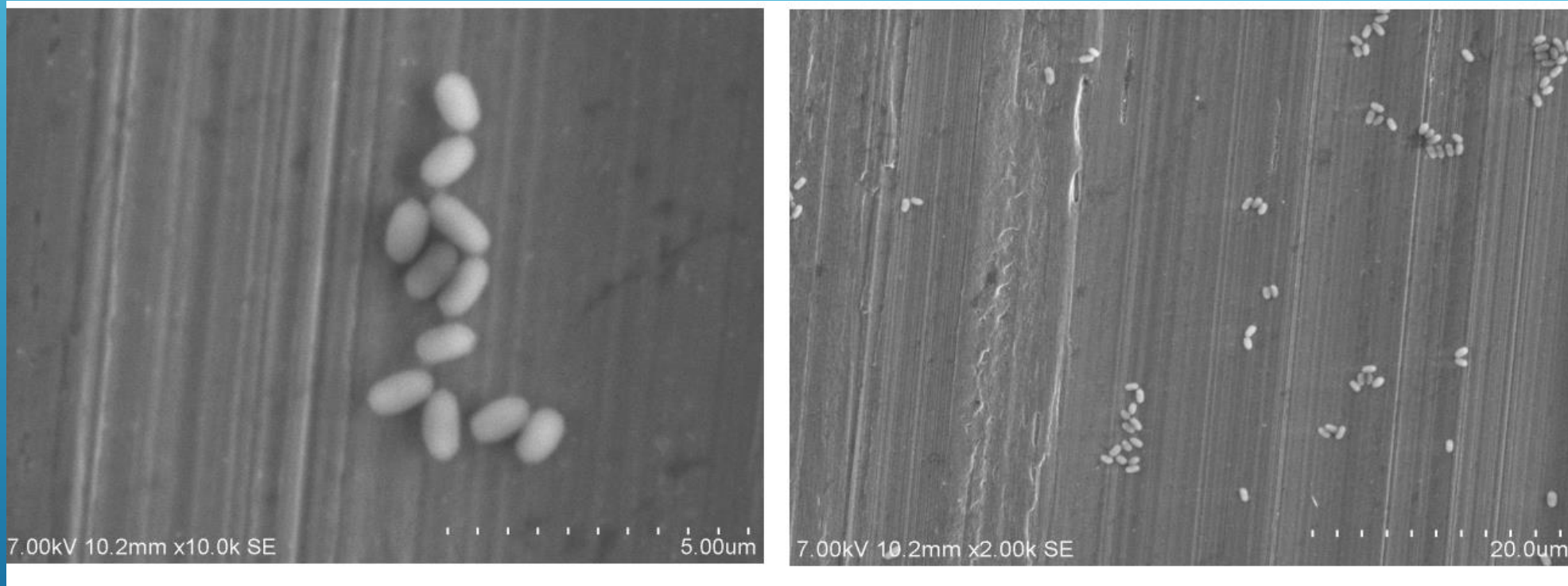
HOW DO YOU DETECT A BIOFILM?

- ATP
- Indicator Gel
- Bactiscan – High Intensity UV Waves on surfaces fluoresces soils & biofilms



Biofilm Basics

Removal of a biofilm requires more than standard cleaning

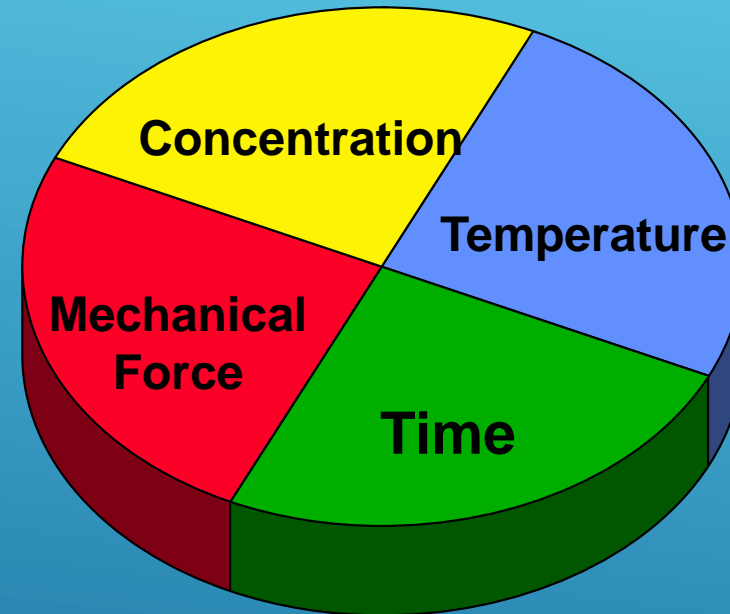


Cleaning with strong caustic DID NOT REMOVE THE SPORES
Peroxide/peracid cleaning removed most of the soil but did not get all the bacterial residue off the surface. (No viable cells recovered)



Basic Sanitation

1. Rinse
2. Wash
 1. Time
 2. Temperature
 3. Concentration
 4. Mechanical Action
3. Rinse
4. Sanitize



Basic Procedures

- 1.Keep it Cold
- 2.Keep it Clean
- 3.Keep it Moving

This can work well for spoilage organisms



Basic Procedures

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This can work well for spoilage organisms

WHAT ABOUT PATHOGENS?



FDA Investigations Operations Manual

4.3.7.7.1 - Environmental Sampling – page 26

Zone 2: Encompasses the areas directly adjacent to food contact surfaces (Zone 1). For investigations focusing on Salmonellae, this is the area where environmental contamination is most likely to directly affect safety of the product. ***In a small production room, Zone 2 encompasses all non-food contact surfaces in the processing area, such as the exterior of equipment, framework, food carts, equipment housing, gears, ventilation and air handling equipment, and floors.*** In a much larger room (e.g. 20,000 square feet) Zone 2 is the area in the immediate vicinity of food contact surfaces, such as around the exposed product in which you could envision a pathway to product contamination either through the actions of man or machine



Periodically incidents have caused problems for the industry

Umpqua Dairy products recalled

Aug 19, 2010 Updated Aug 19, 2010

JEWEL CLOSES HILLFARM DAIRY

By Jon Van and Science writer
Chicago Tribune • Apr 10, 1985 at 12:00 am

A National Outbreak of *Salmonella enteritidis* Infections from Ice Cream

Thomas W. Hennessy, M.D., Craig W. Hedberg, Ph.D., Laurence Slutsker, M.D., M.P.H., Karen E. White, M.P.H., John M. Besser-Wiek, M.S., Michael E. Moen, M.P.H., John Feldman, B.S., William W. Coleman, M.S., Larry M. Edmonson, M.P.H., Kristine L. MacDonald, M.D., M.P.H., and Michael T. Osterholm, Ph.D., M.P.H.



Advances in detection increase exposure:

Whole Genome Sequencing

The New York Times

**For Blue Bell, a Drastic Move to Recall
Ice Cream as Listeria Findings Rose**



American Meat Institute's (AMI) 10 Principles of Sanitary Equipment Design

These recommendations will provide the plant with a clear and straightforward guidance for equipment design no matter what type of food is being processed. Equipment that is considered “sanitary” should be:

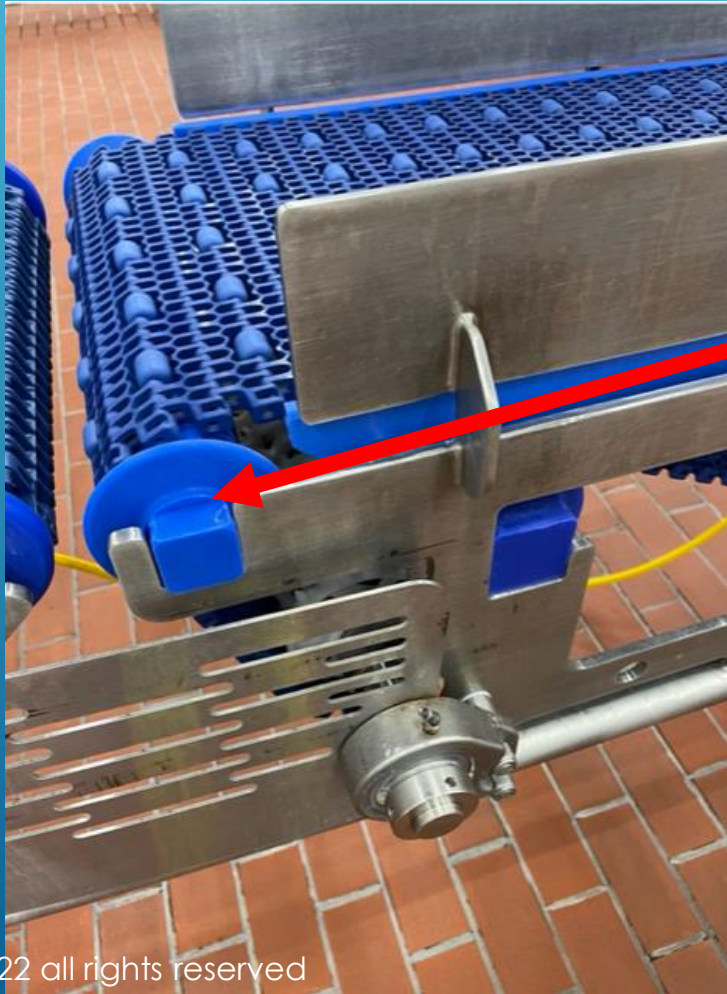
1. **Cleanable to a microbiological level.**
2. **Made of compatible materials.**
3. **Accessible for inspection, maintenance, cleaning and sanitation without special tools.**
4. **No product or liquid collection areas.**
5. **All hollow area hermetically sealed.**
6. **No niches.**
7. **Must be able to operate in a sanitary manner.**
8. **Hygienic compatibility with other plant systems.**
9. **Hygienic design of maintenance enclosures.**
10. **Be able to validate cleaning and sanitizing protocols.**

The message from the 10 Principle of Sanitation Equipment Design is to “keep it simple.” The more difficult it is to clean a piece of equipment the easier it is for that piece of equipment to pose a food safety challenge.



What does the Dairy Industry need to do?

Start installing easier to clean equipment

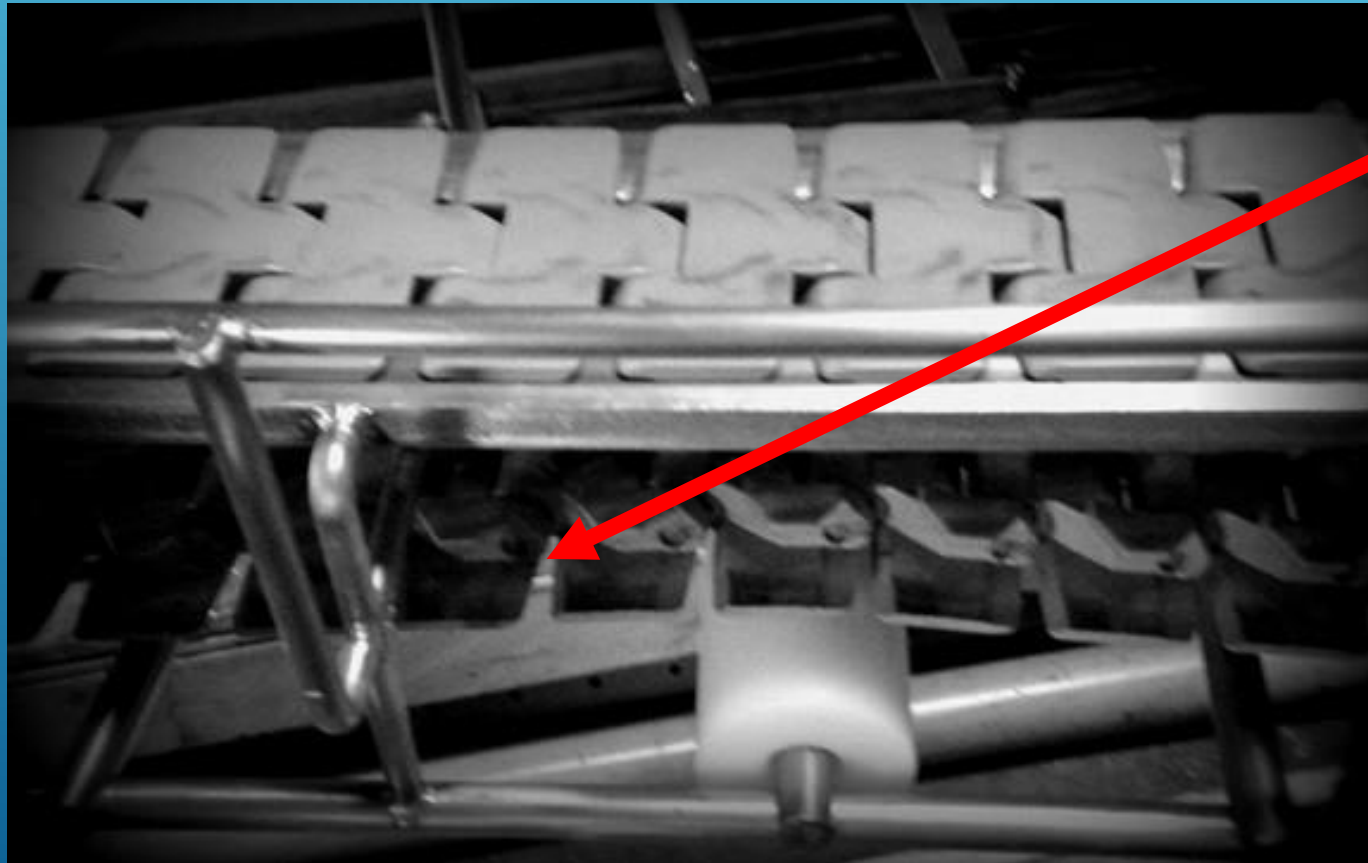


Removable without tools



What does the Dairy Industry need to do?

Start installing easier to clean equipment



Open sides for cleaning



What does the Dairy Industry need to do?

Start looking in your facilities for design issues

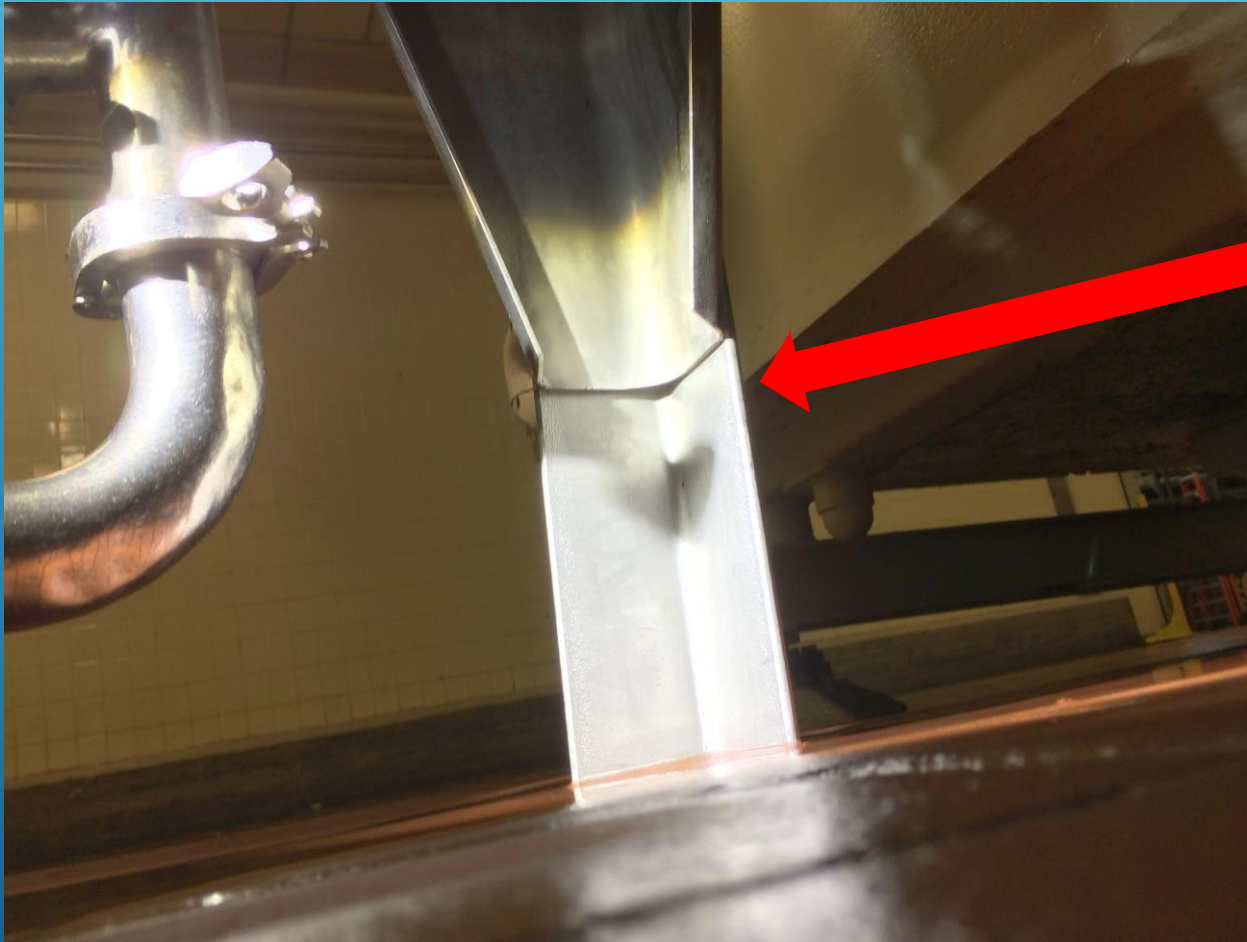


Uncleanable joint



What does the Dairy Industry need to do?

Start looking in your facilities for design issues



Uncleanable
area of leg



What does the Dairy Industry need to do?

Start looking in your facilities for maintenance issues



Rough weld



What does the Dairy Industry need to do?

Start looking in your facilities for sanitary issues

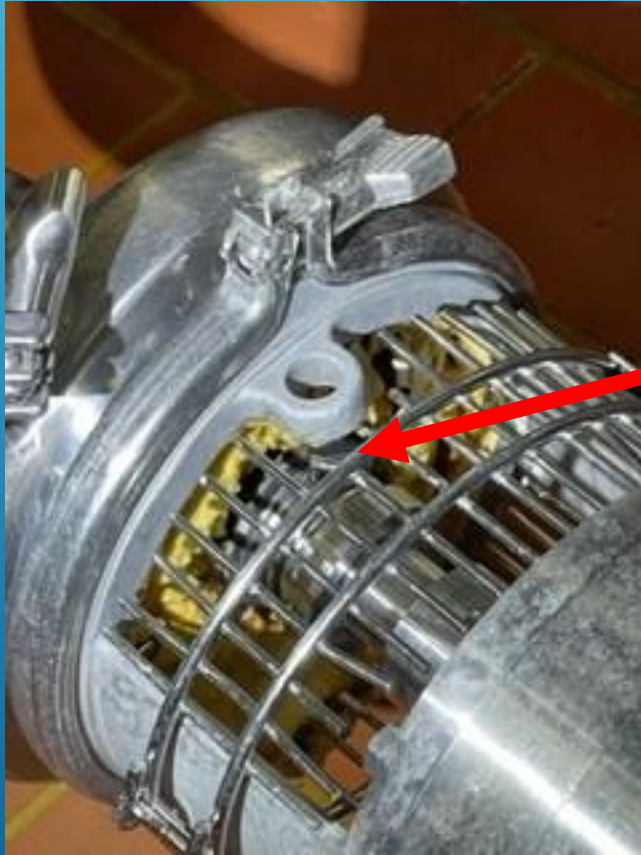


Crimped hose on floor



What does the Dairy Industry need to do?

Start looking in your facilities for sanitary issues

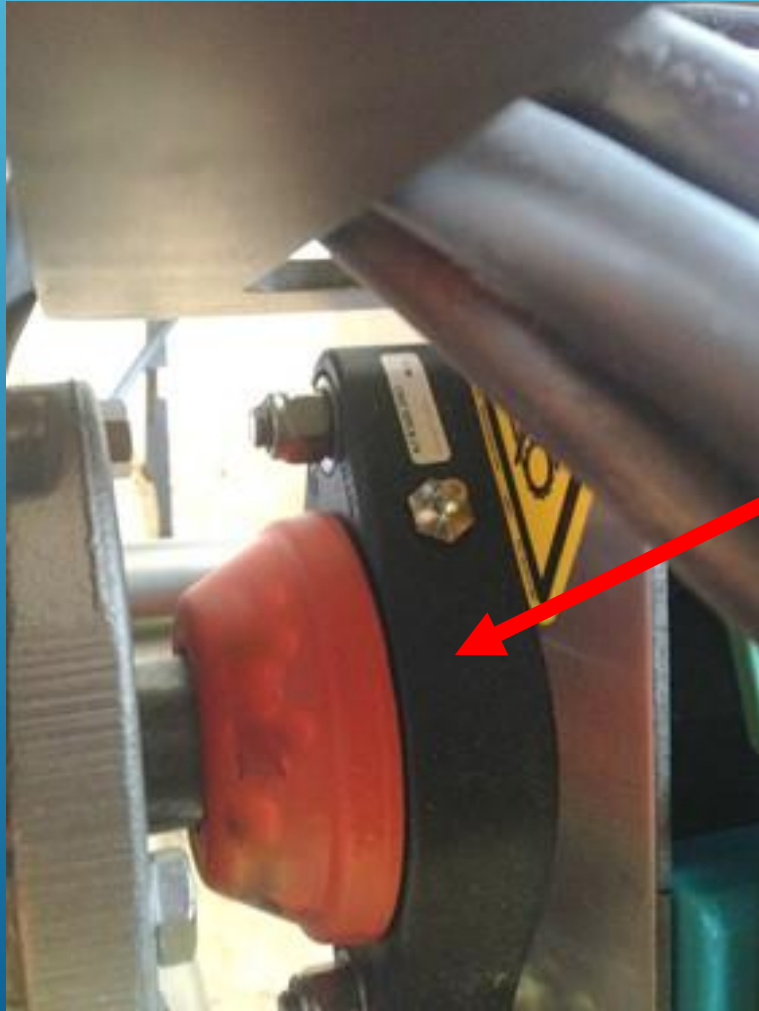


Soil behind seal



What does the Dairy Industry need to do?

Start looking in your facilities for sanitary issues



Hard to reach to clean



What does the Dairy Industry need to do?

Start looking in your facilities for sanitary issues



Overtightened clamp



What does the Dairy Industry need to do?

Start looking in your facilities for sanitary issues



Worn gasket



What does the Dairy Industry need to do?

Start looking in your facilities for sanitary issues



Product conveyor
on pad on floor



What does the Dairy Industry need to do?

Start looking in your facilities for sanitary issues – air handling



Cooling
Units:

Units must be
clean



What does the Dairy Industry need to do?

Start looking in your facilities for sanitary issues



What does the Dairy Industry need to do?

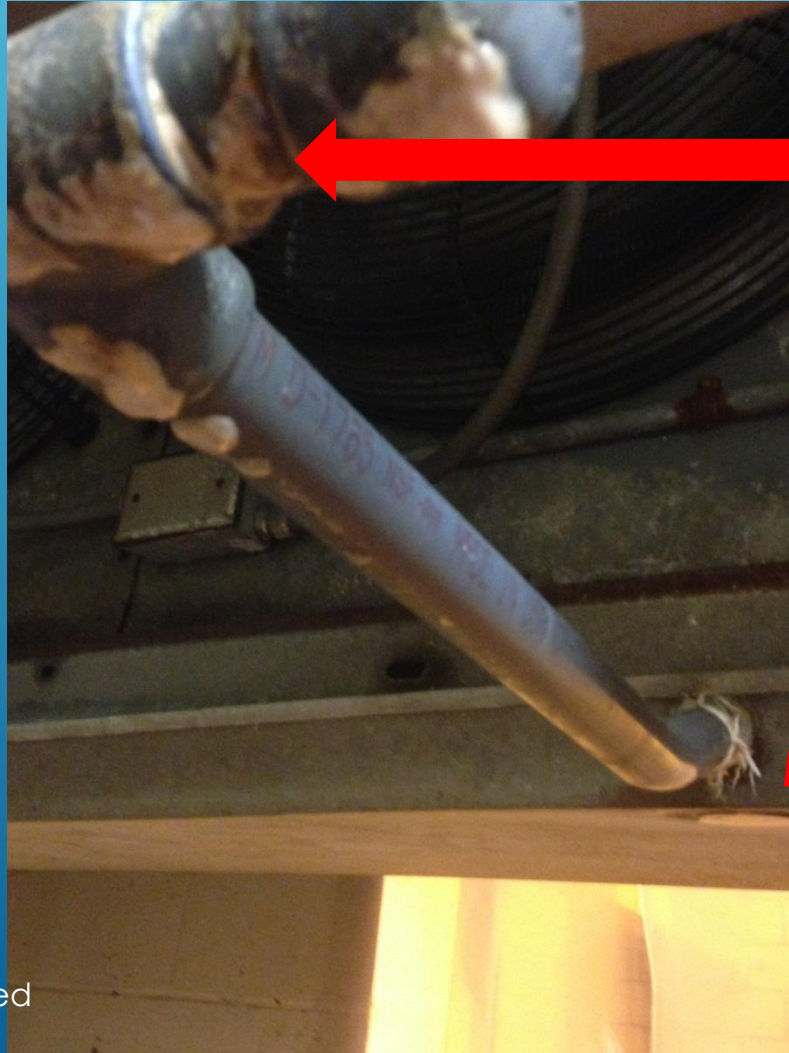
Start looking in your facilities for sanitary issues



What does the Dairy Industry need to do?

Start looking in your facilities for sanitary issues – air handling

Cooling Units:



Units must be cleaned

Units must DRAIN



What does the Dairy Industry need to do?

Do you perform dry cleaning?

Vacuum cleaners used in operation:



Use HEPA filtered vacuums, keep them in an area and TEST THE FILTERS!





DON'T FORGET UTILITIES





HOW CAN YOU CLEAN A WHEEL?





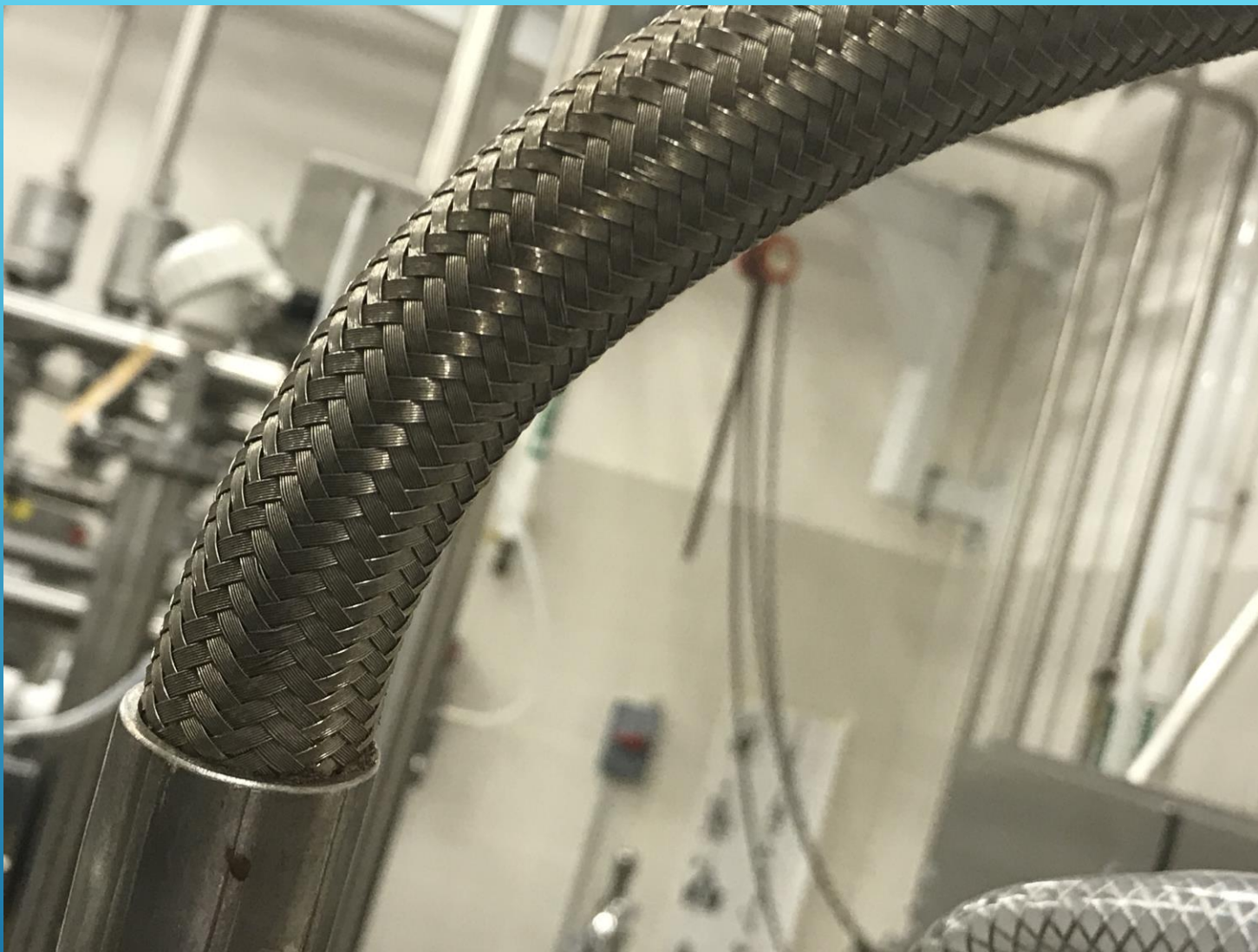
INCOMPLETE WELDING





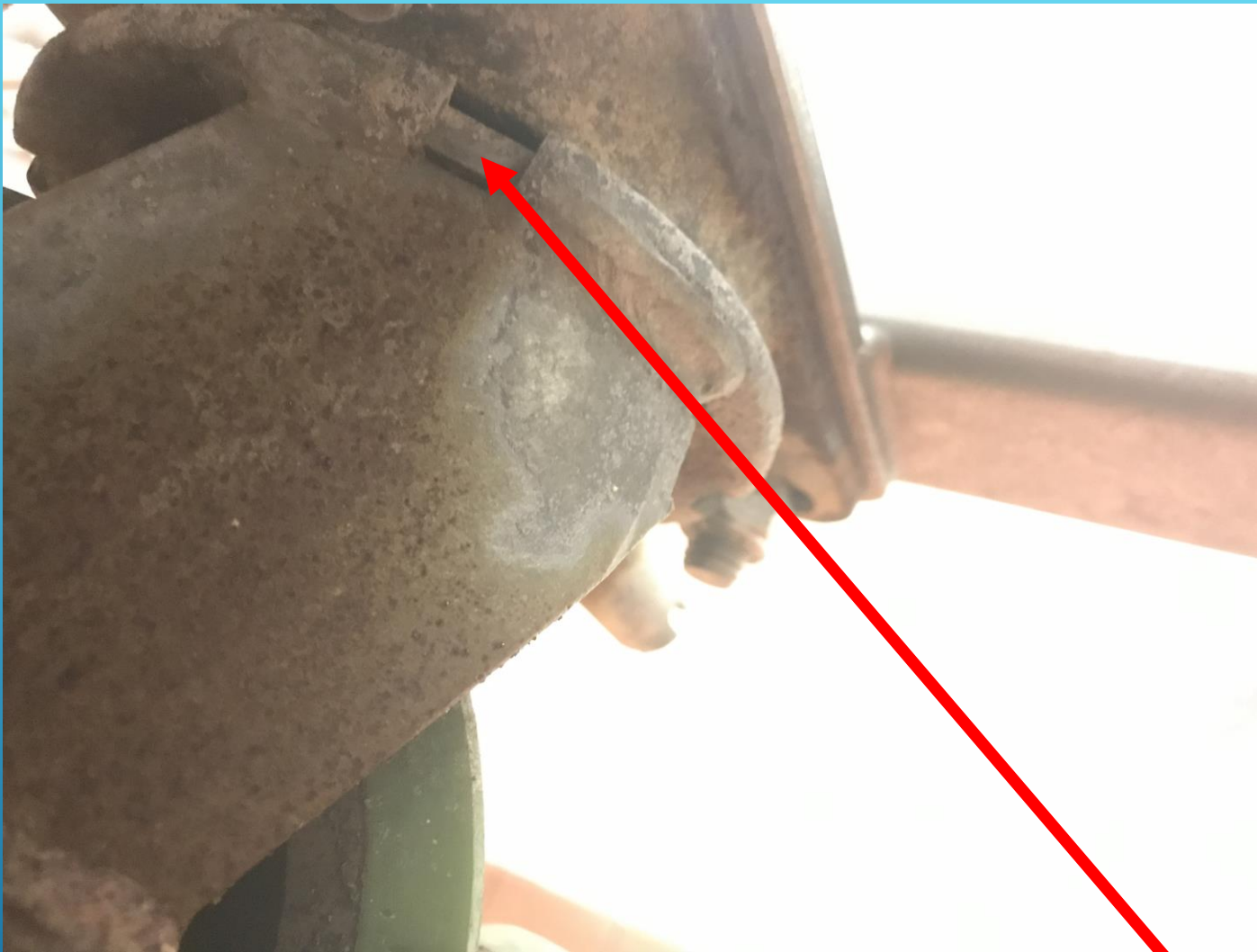
BOLTS ON EQUIPMENT





BRAIDED HOSES ARE NOT CLEANABLE





OLD EQUIPMENT HAS HARBORAGES





TEMPORARY REPAIRS





SANDWICHED PARTS

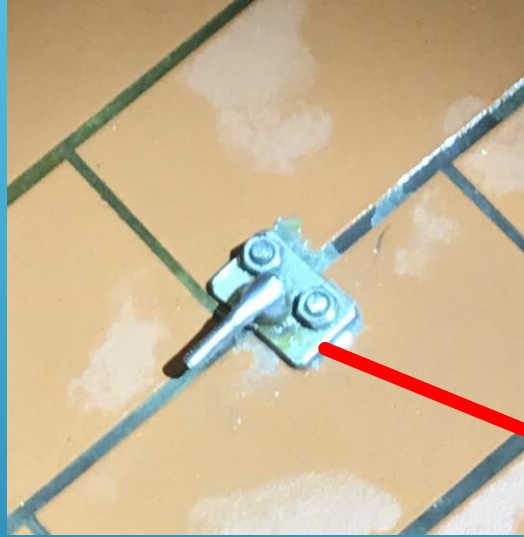


OLD CLAMPS



CLAMPS – REMOVE THIS TO CLEAN
UNDERNEATH IT





BOLTED EQUIPMENT



We are in an unprecedented time where one organism from an illness can be traced back to a plant. What can we do?



Aggressively look for pathogen hiding places and aggressively clean them.

New technologies can help:

- Cultural methods – e.g. High Temperature Enterobacter (HTEB) screens for organisms similar to Salmonella to allow for tracking
- Instrumental methods – e.g rapid RNA analysis such as Listeria Right Now that screens for Listerial RNA in an hour



The future?

Sampling and testing will become more accurate and faster. To meet these improvements, industry will need to aggressively clean their facilities and upgrade their equipment



Questions????



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