Gasket Plate Heat Exchangers in Brewery
Run Longer, Safer and Better with Alfa Laval

– San Miguel Virtual Webinar – 15 July 2022

Syvelster Alunan

Alan Dodd

Mats Forslund

Ulf Grevillius

Run Longer, Safer and Better with Alfa Laval

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Introduction

Thank you for taking the time to join us today as we will talk about “Run Longer , Safer and Better with Alfa Laval”.

In this webinar You’ll learn and understand:

- ✓ Planning & Monitoring of GPHE
- ✓ Prevention for fouling, scaling, or clogging
- ✓ Preventive Maintenance Service schedule
- ✓ Manage lifetime prediction (gaskets, plates and frame)
- ✓ Manage service efficiency (parts availability)
- ✓ Importance of using genuine gaskets or spare parts

And, to make sure were helping you as best as we can , we have a chatbox to source your questions. Feel free to drop questions on the topic or share your struggles and experiences. We will answer your questions by the end of the session

Host and Speakers

– San Miguel Virtual Webinar – July 2022

Syvelster Alunan
Sales Manager
Service Division – Food & Water, Energy

HOST

Alan Dodd
Regional Business Manager
Service

SPEAKER

Ulf Grevillius
Senior Global Product Expert
Sales Development - Services

SPEAKER

Mats Forslund
Global Service Technology Manager

SPEAKER

Run Longer, Safer and Better with Alfa Laval

– San Miguel Virtual Webinar – July 2022

Agenda

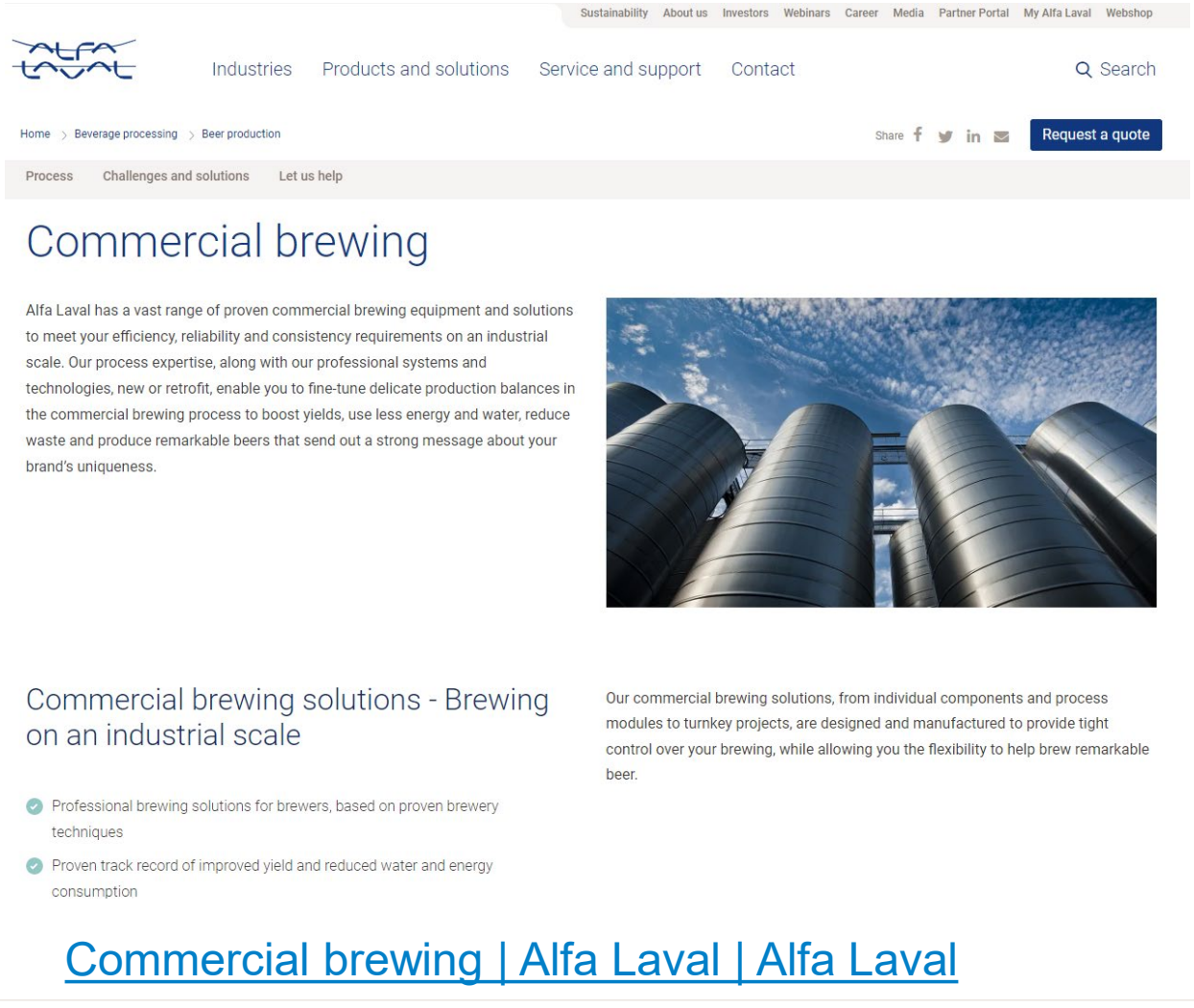
Introductions	Syvelster
Our total offering to Breweries	Alan
Our Service and Sustainability focus	Alan
Working principles of a plate heat exchanger ○ Heat transfer basics ○ PHE start/stop	Ulf
New Hygienic Range	Mats
Break 10 mins	
Integrity testing & VCA	Alan
PHE in Brewery ○ Go through the process ○ Key issues, typical pain points and maintenance recommendations	Mats & Ulf
Q & A	All

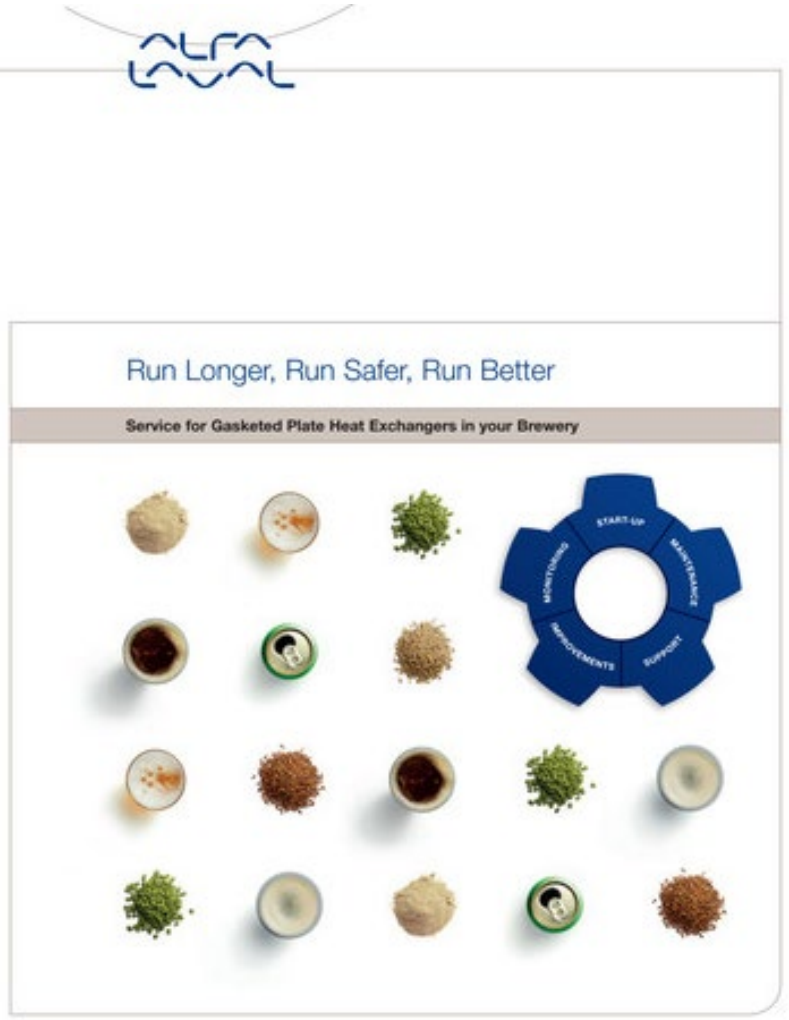
House Rules of the Webinar

- Put your microphone on mute when necessary. This is to prevent unwanted background noise from distracting the host, speakers and participants.
- Questions and Clarifications will be entertained after the talk . You may turn on your microphone or may use the chatbox. The host will tell you if you are already recognized.
- Be an active participants , feel free to share your inputs or write your questions and suggestions in the chatbox, because this gives the speaker an idea of which sub-topics you are also interested in so that the speaker can include that in the discussion as well.
- Take down notes. Taking down notes will help you to remember key points from this webinar which you think will be beneficial to you.
    - At the end of the session we will have a short quiz , I will randomly pick a participant and ask a relative questions. Correct answer will receive an exciting gift from alfa laval.

Run Longer, Safer and Better with Alfa Laval

– Alfa Laval in Brewery





[Commercial brewing | Alfa Laval | Alfa Laval]

Alfa Laval equipment in Brewery

- GPHE
- Decanters
- High Speed Separator
- Modules (pasteurisation, dearation, thermolyzation, blending and carbonation, deacholisation, propagation...etc
- Pumps
- Valves
- Tank cleaning equipment
- Tanks (storage etc)
- Boilers
- Filtration
- ...

PHEs

Decanter

HSS

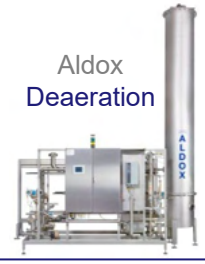
Yeast plant
Propagation

Thermolyzer
Yeast autolyzation

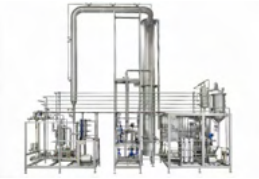
Flexitherm
Pasteurisation

Carboblend
Blending & carbonation

Aldox
Deaeration



De-alc
Dealcoholisation



Pumps

Valves

Rotary jet heads
Cleaning

Yeast plants
Storage

Top tank systems
Yeast & fermentation management

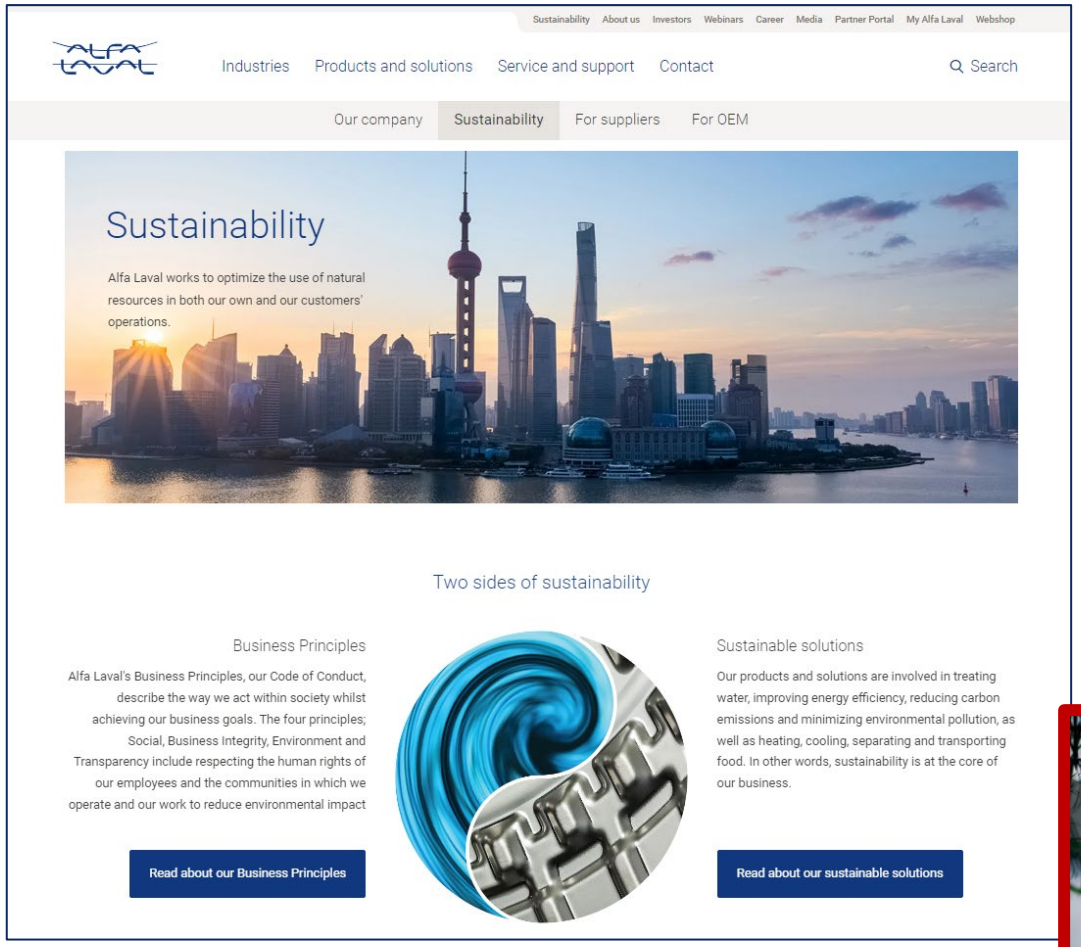
Industrial boilers

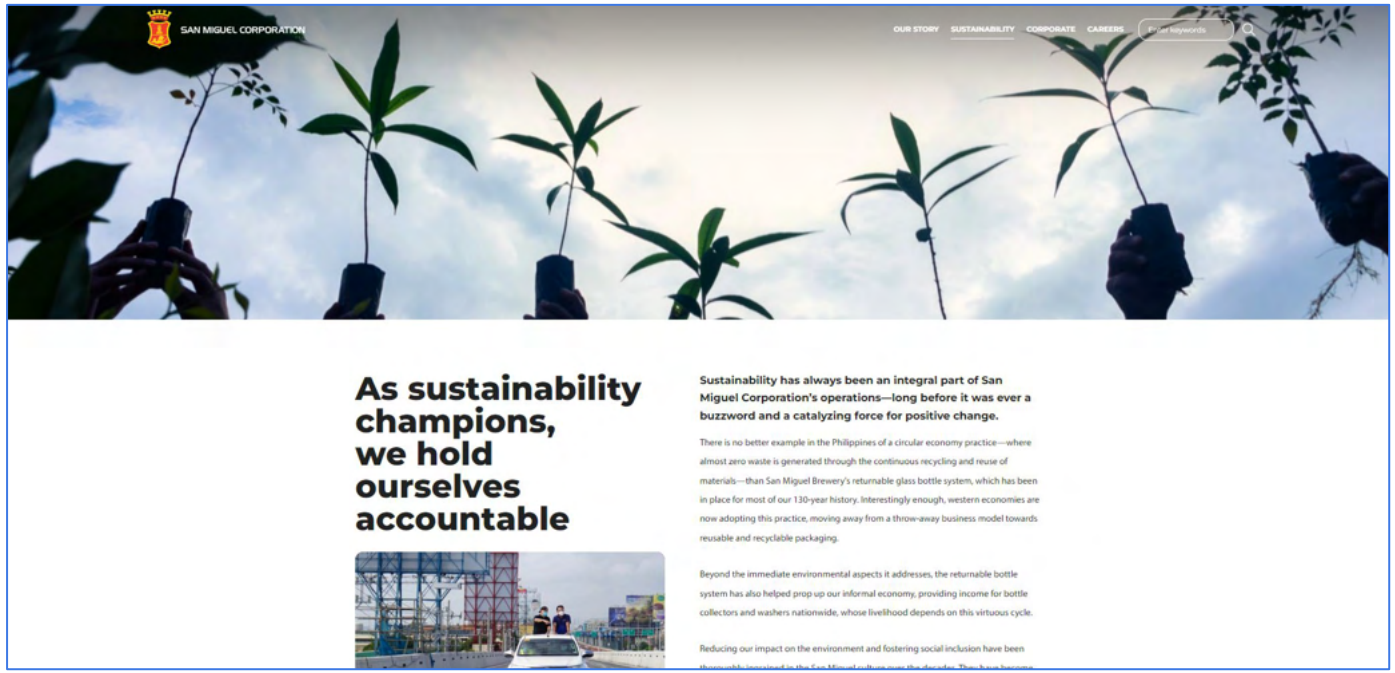
BSF
Sterile filtration

www.alfalaval.com

Sustainability

– Let us achieve our goals together





Local expertise – global network

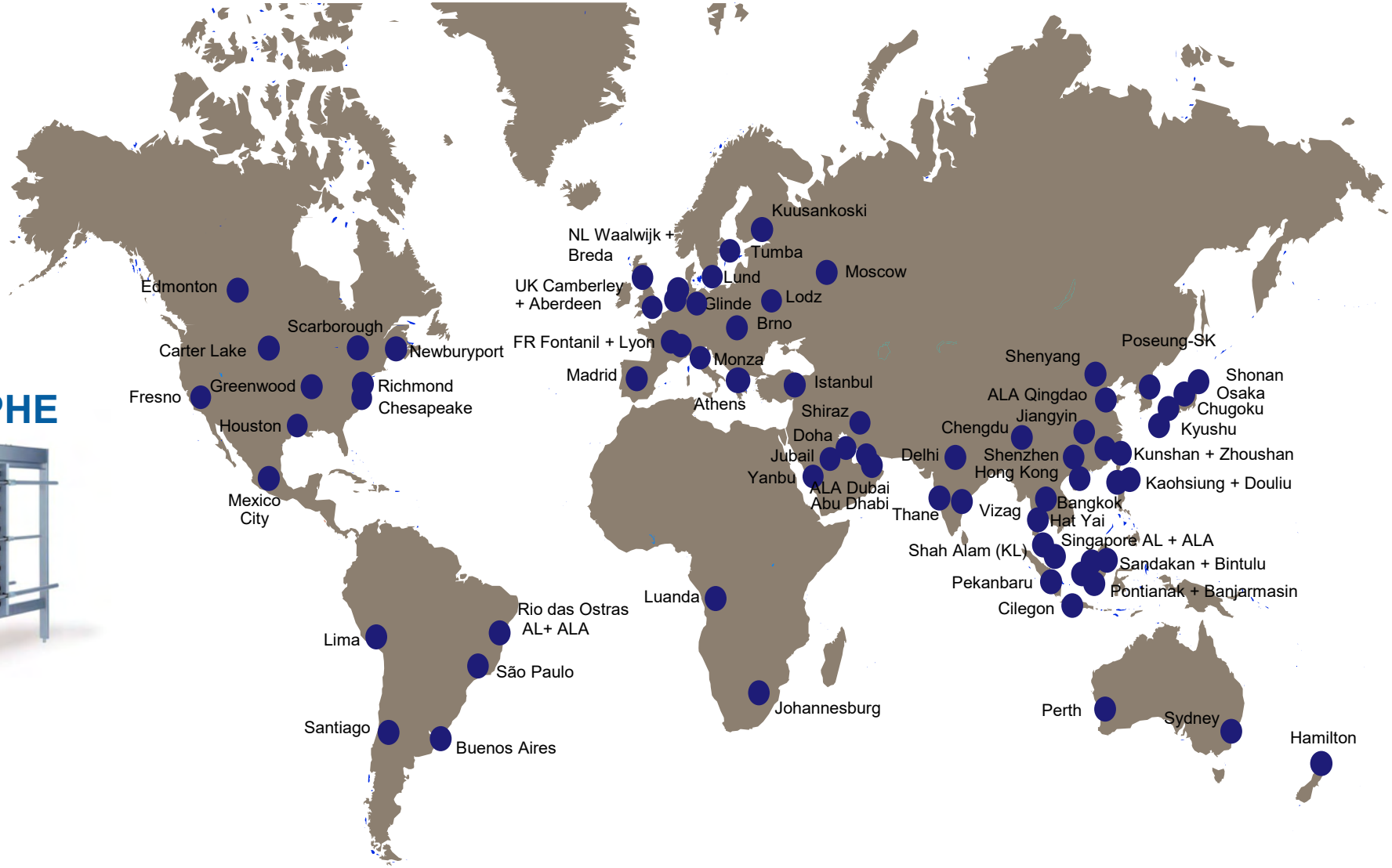
Expert help close at hand

- Strong local presence
- Dedicated Heat Exchanger Field service engineers & specialists
- Distribution centres
- Heat Exchanger Service personnel in close to 100 countries
- 24/7 support through local presence and regional service centres around the world
- Years of Heat Exchanger experience at your disposal to find the right root causes

AllBrands of Gasket Heat exchangers covered

Alfa Laval Service Operation Infrastructure

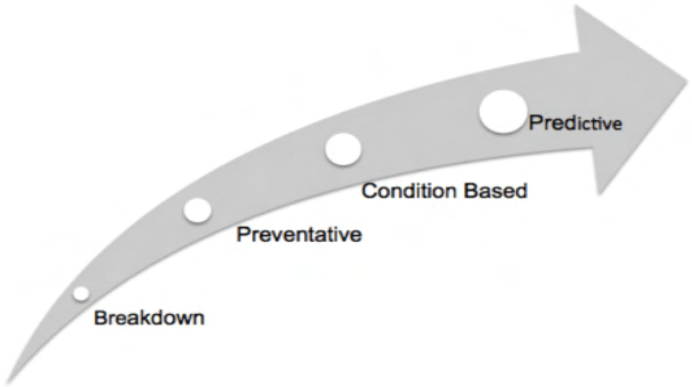
A network of Service Centers in 71 locations

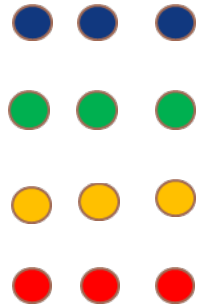


60 for PHE

Industry Trends

– Maintenance Culture development





Breakdown maintenance

Fix when it breaks – totally reactive

Preventative maintenance

Time based maintenance to a plan

Condition-based maintenance

Monitoring condition and identifying failures

Predictive maintenance

On-line monitoring with sensors and connecting data of process to trend potential failures

Unlikely	Low adoption	Common	Aspiring

Run Longer, Safer and Better with Alfa Laval

– Life Cycle Services

Monitoring services

- Condition audit
- Condition monitoring
- Performance audit

Improvement services

- Equipment upgrades
- Redesign
- Replacement and Retrofit

Support services

- Exclusive stock
- Remote support
- Technical documentation
- Training
- Troubleshooting

Start-up services

- Commissioning
- Commissioning supervision
- Installation
- Installation supervision

Maintenance services

- Calibration
- Preventive maintenance
- Reconditioning
- Cleaning services
- Repair
- Spare parts
- Service kits
- Service tools
- Exchange

PHE working principle

- GPHE
- Design
- MPHE
- Gasket lifetime
- Start & Stop

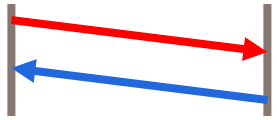
Ulf Grevillius

Fundamentals of Heat Transfer

– Three basic natural laws of physics:

- Heat will always be transferred from a hot medium to a cold medium, until equilibrium is reached.

- There must be a temperature difference between the two media for heat transfer to take place.



- The heat lost by the hot medium is equal to the amount of heat gained by the cold medium, except for losses to the surroundings.

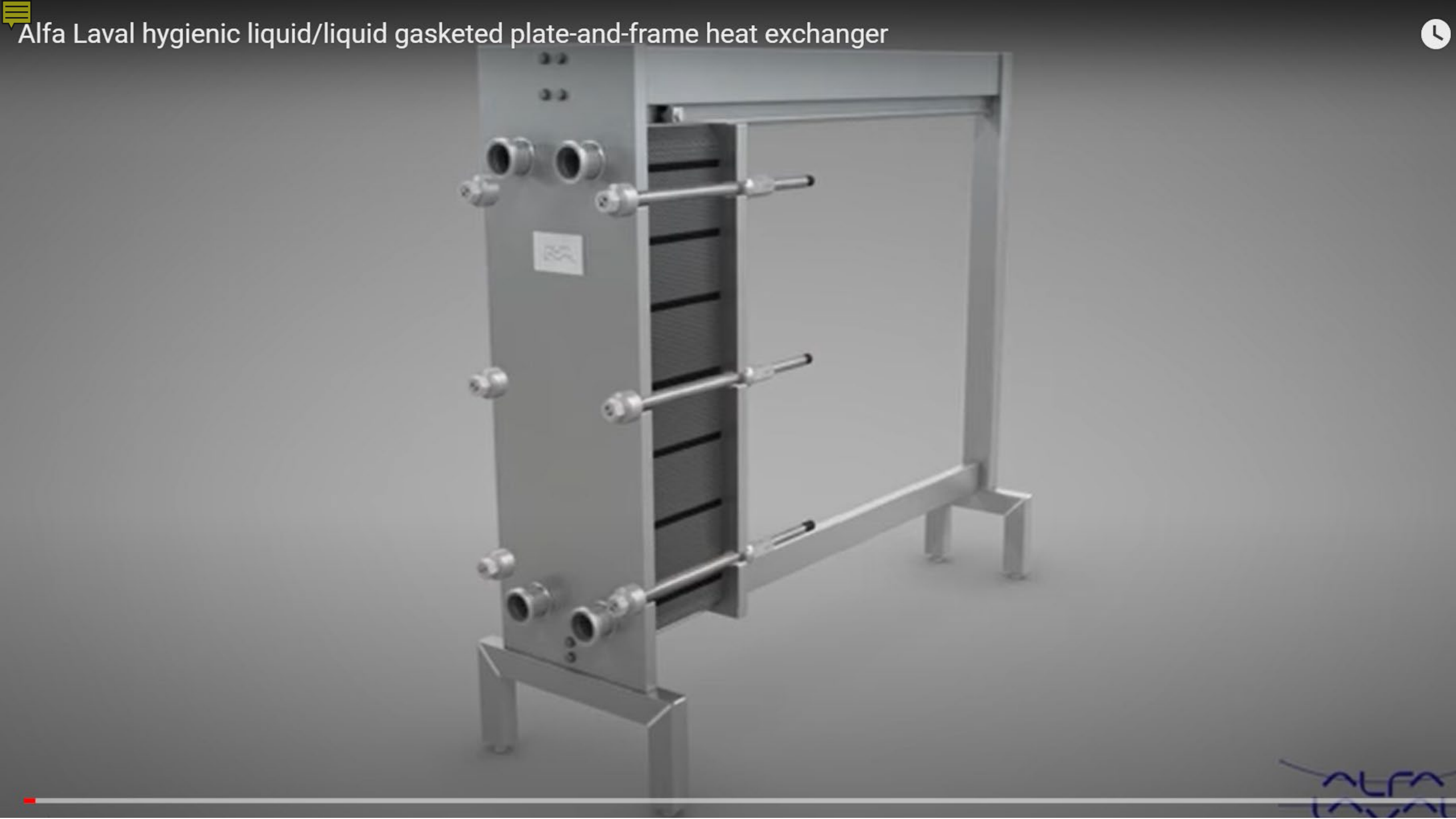
Q1 = Q2

GPHE in operation

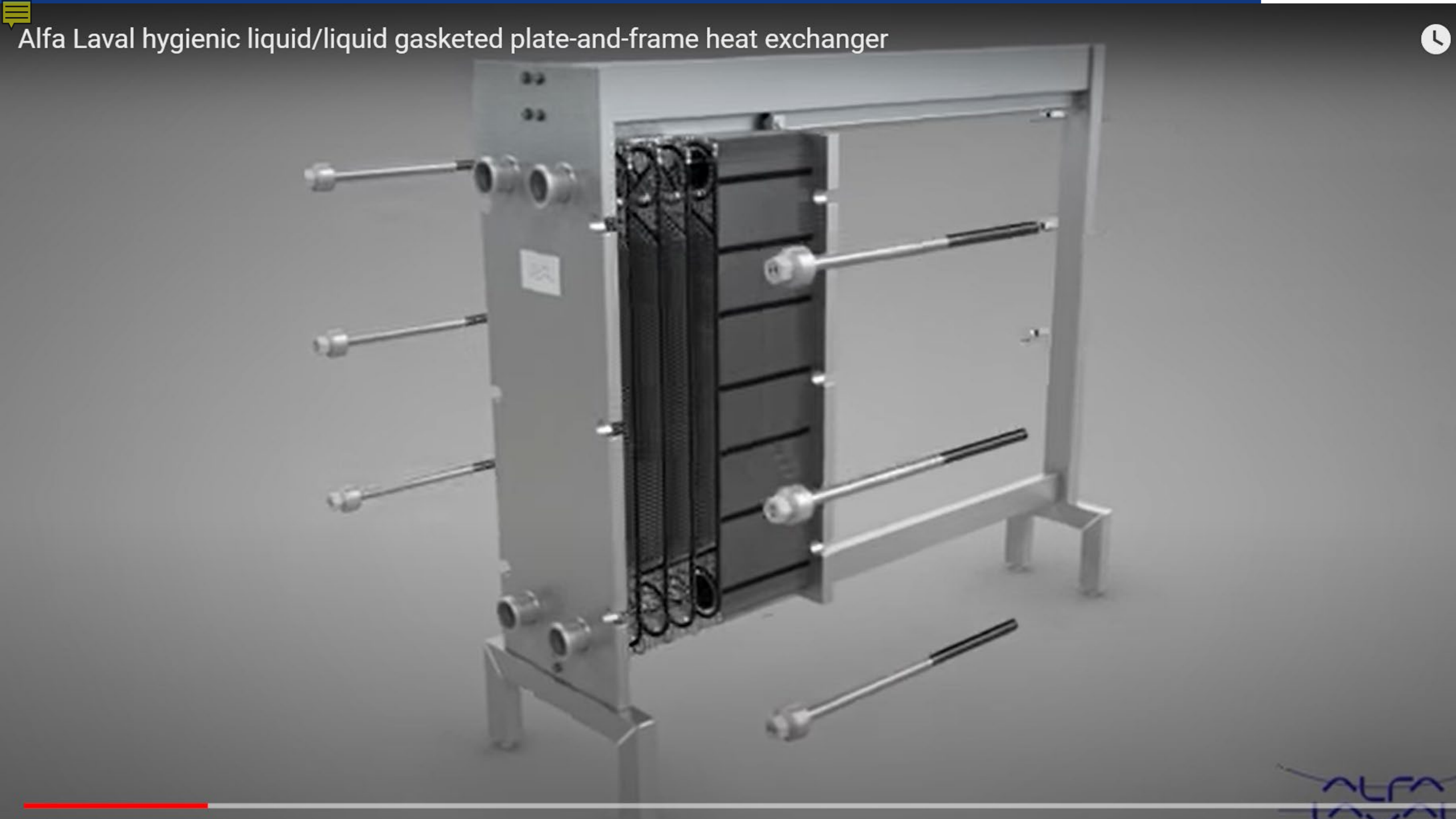
- One pass / one-stroke GPHE

YouTube

https://www.youtube.com/watch?v=lycwTI22Mhs


Alfa Laval hygienic liquid/liquid gasketed plate-and-frame heat exchanger


Alfa Laval hygienic liquid/liquid gasketed plate-and-frame heat exchanger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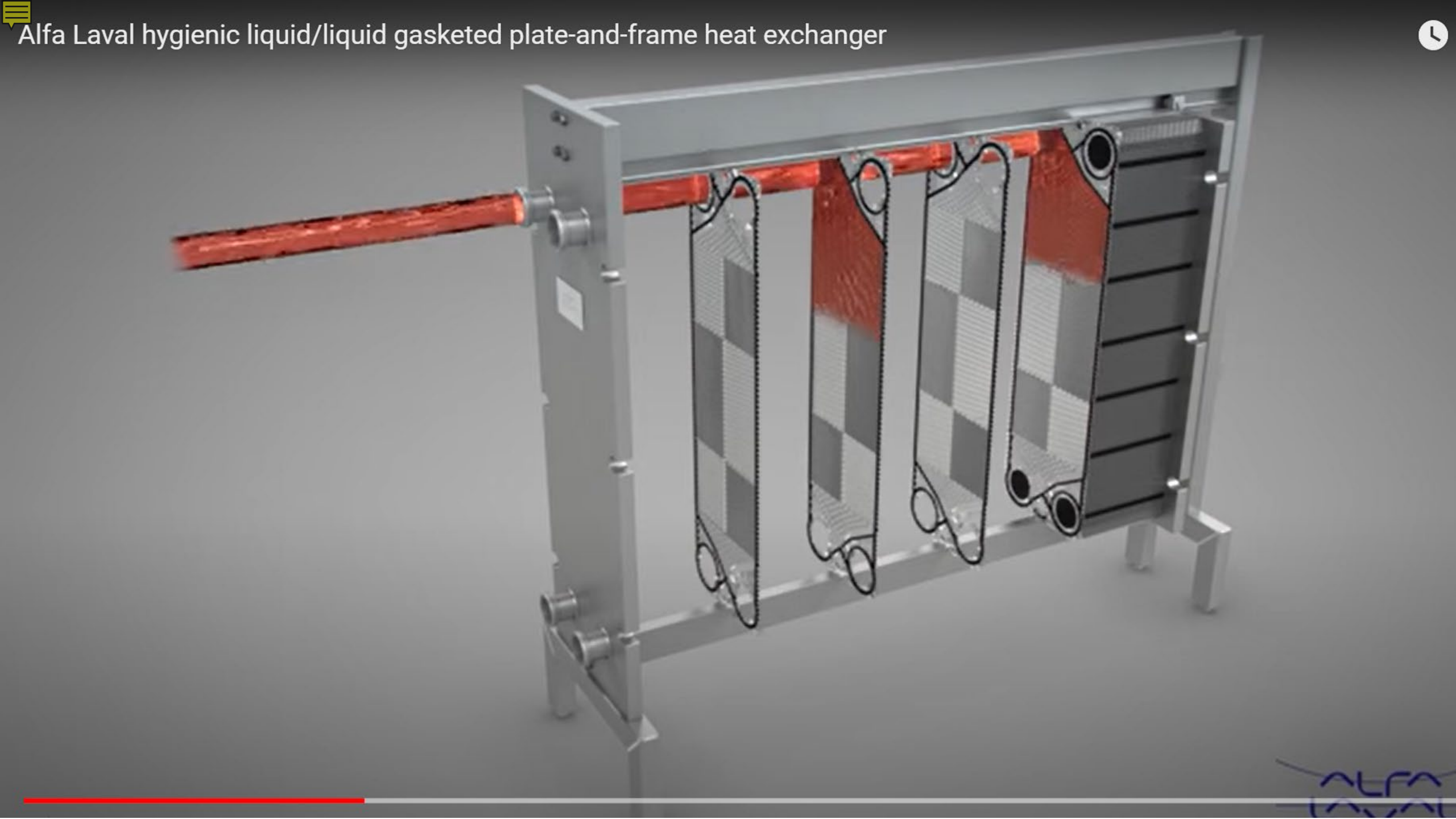
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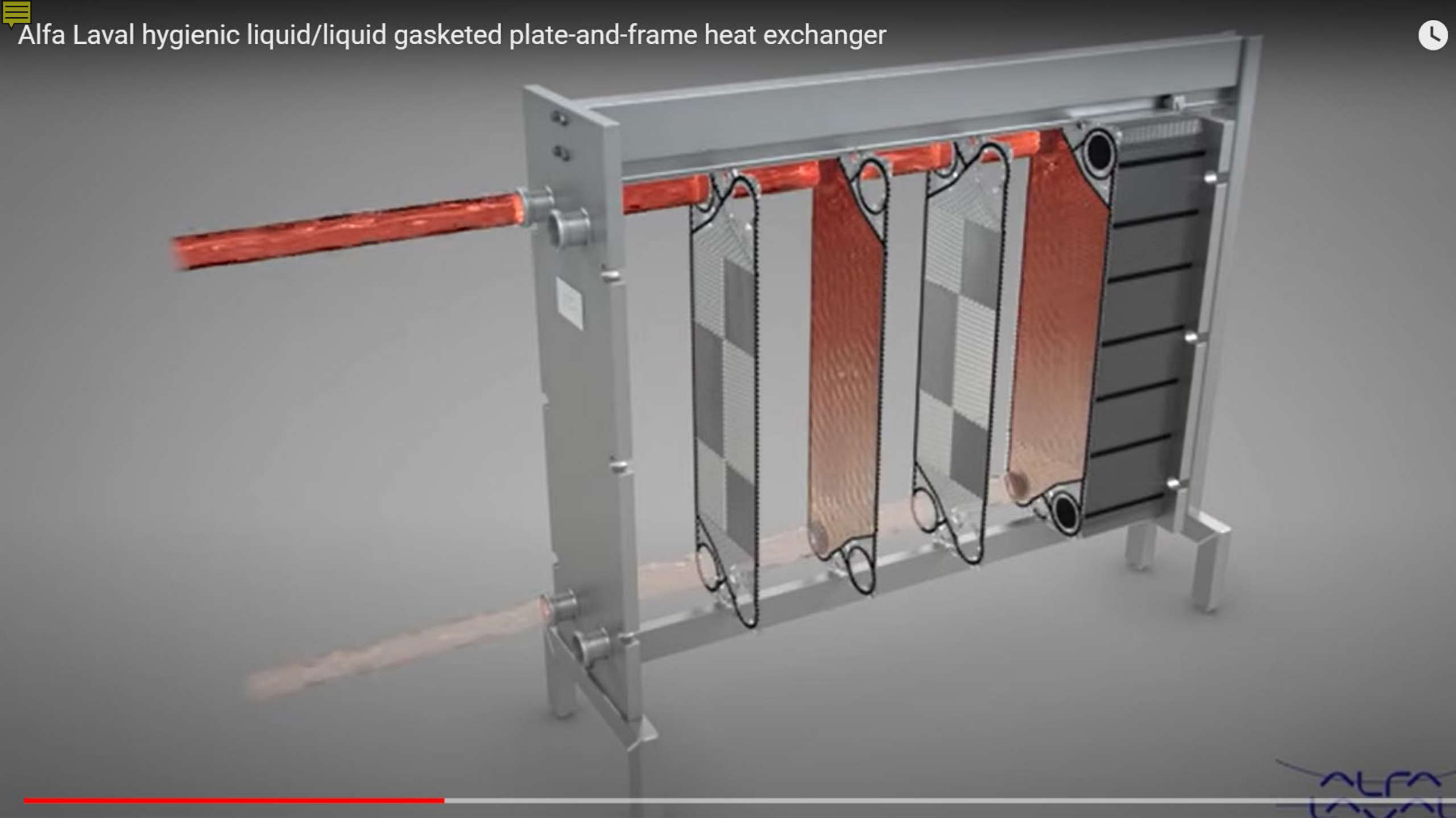
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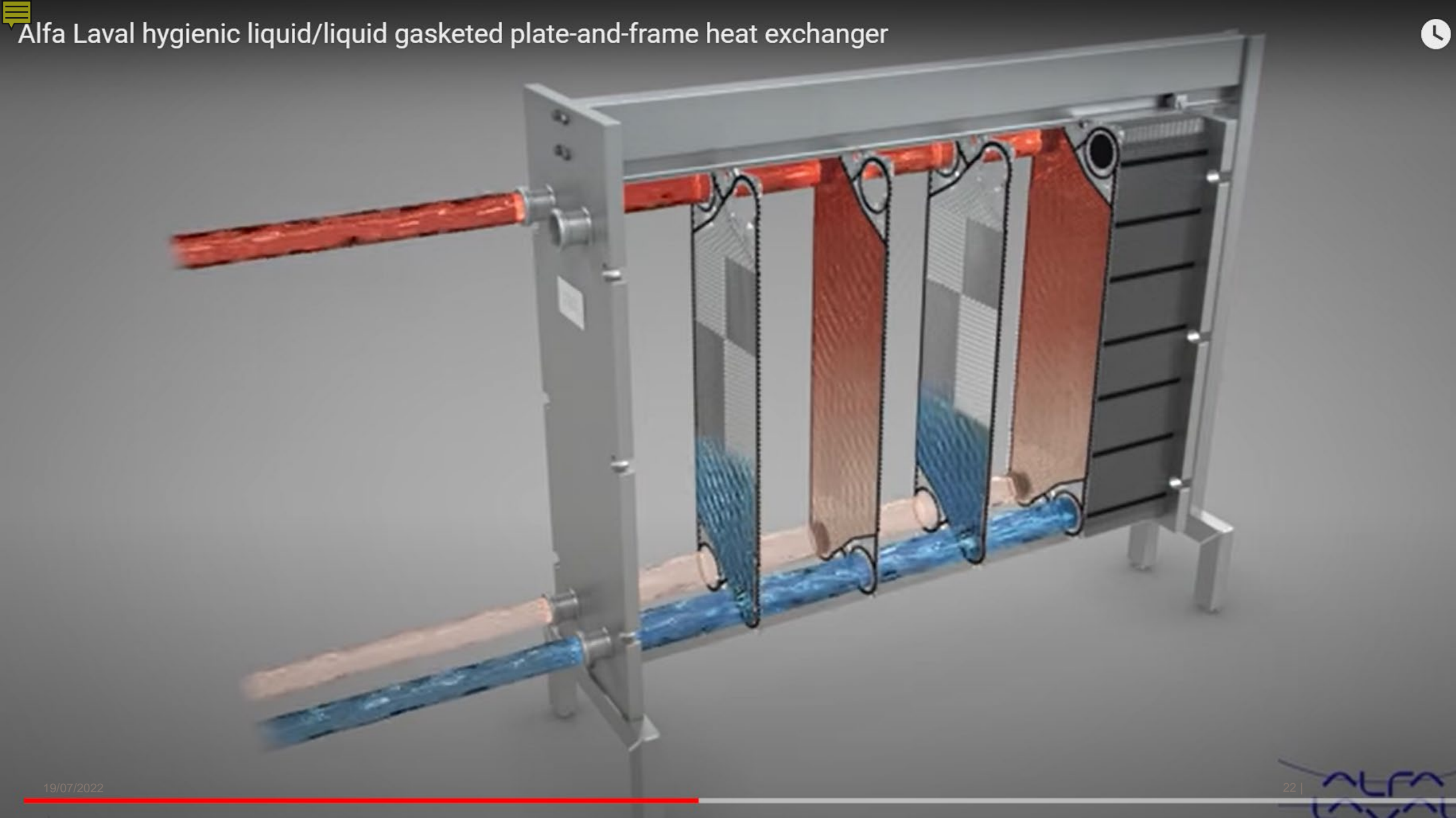
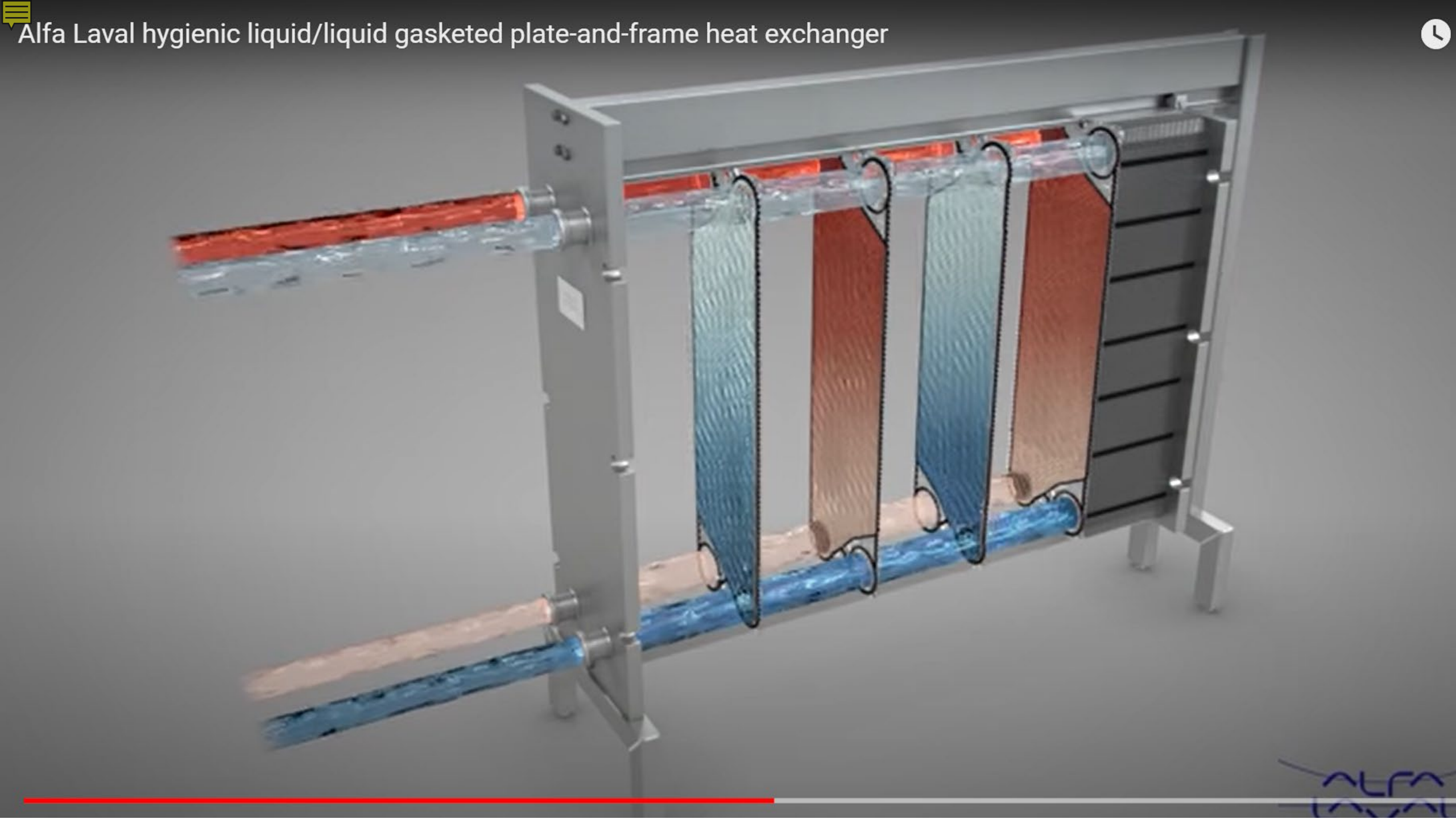



Alfa Laval hygienic liquid/liquid gasketed plate-and-frame heat exchanger

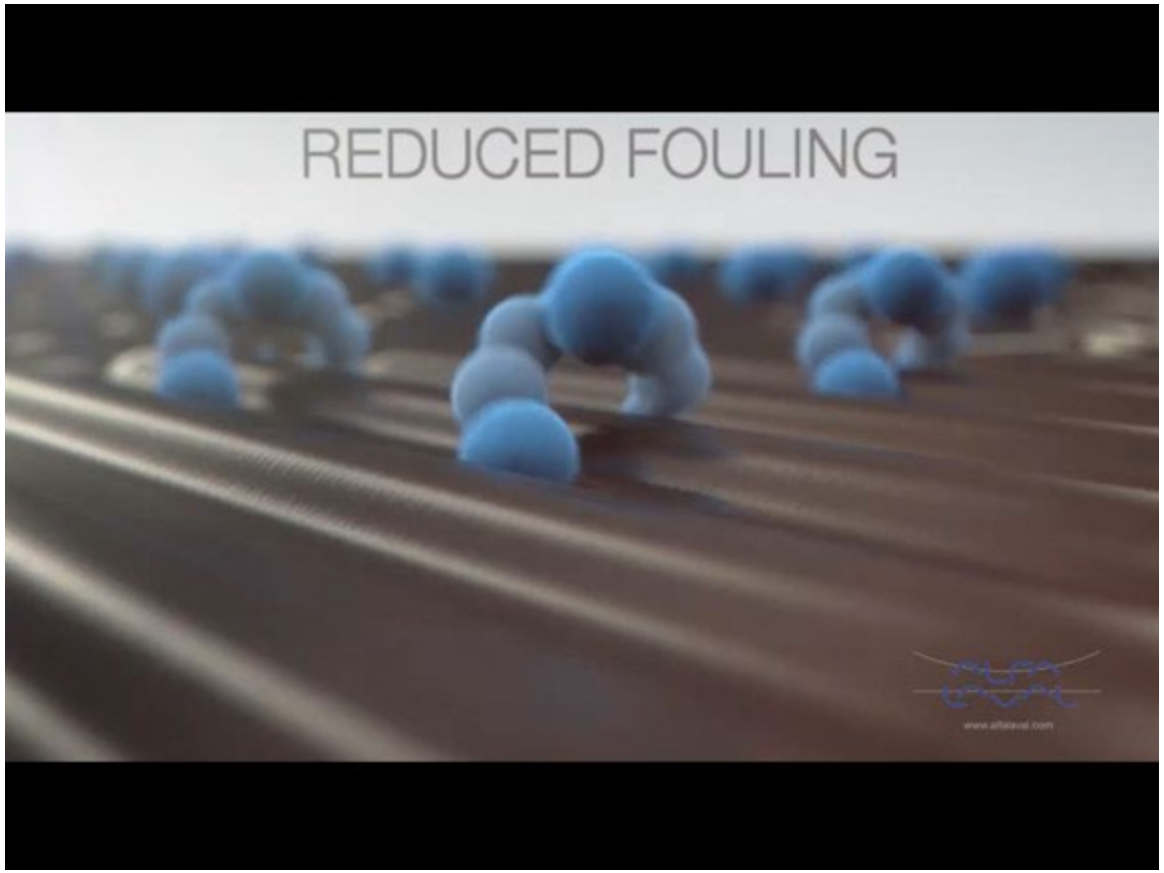
Design a GPHE

– The unique performance for a specific position in the process

- Flow rates
- Physical properties of the different media in the process
- Permitted pressure drops
- Temperature program specified by customer (Heat recovery)

Important to get the design working

- Important with proper flow for……..



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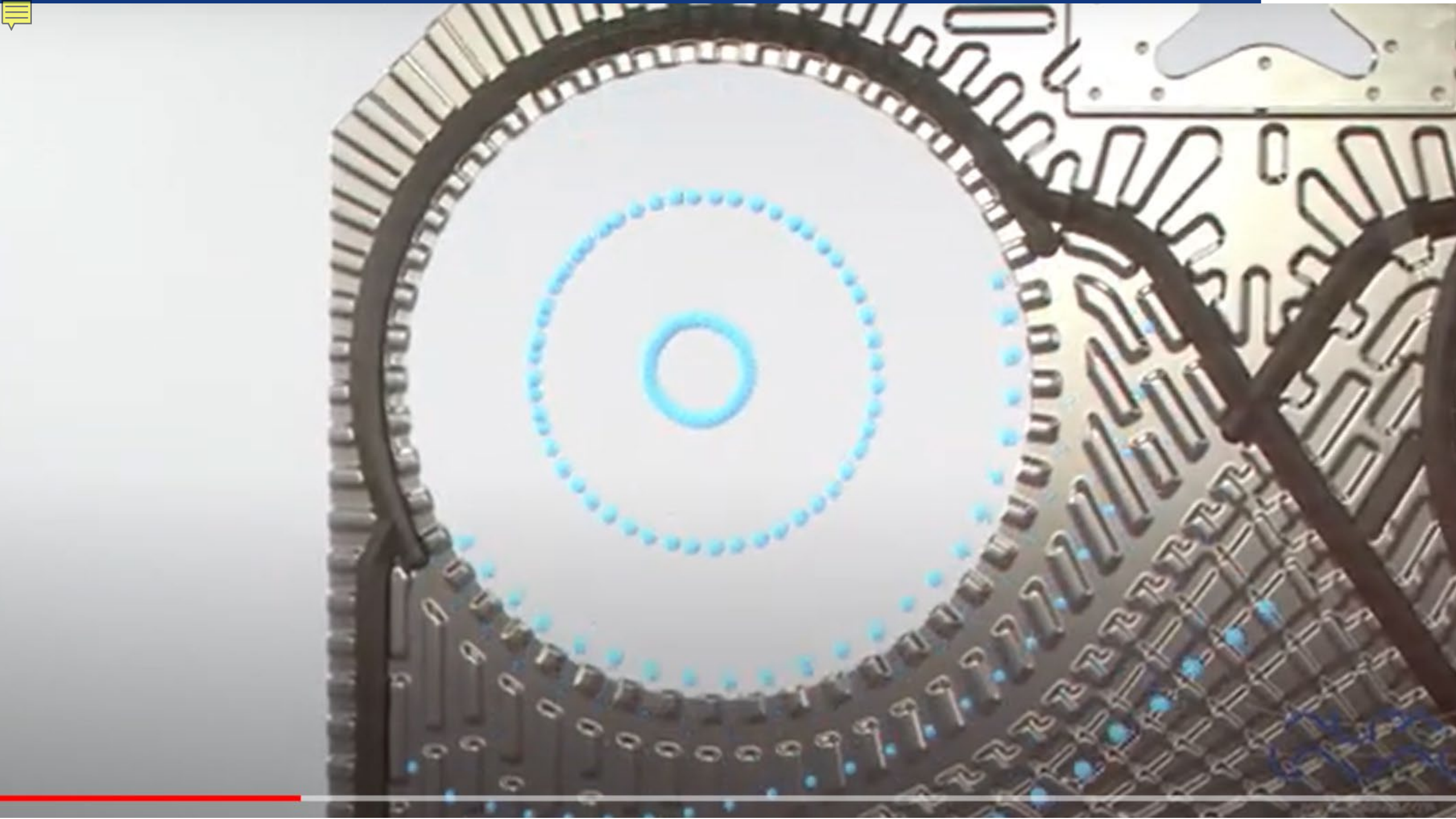
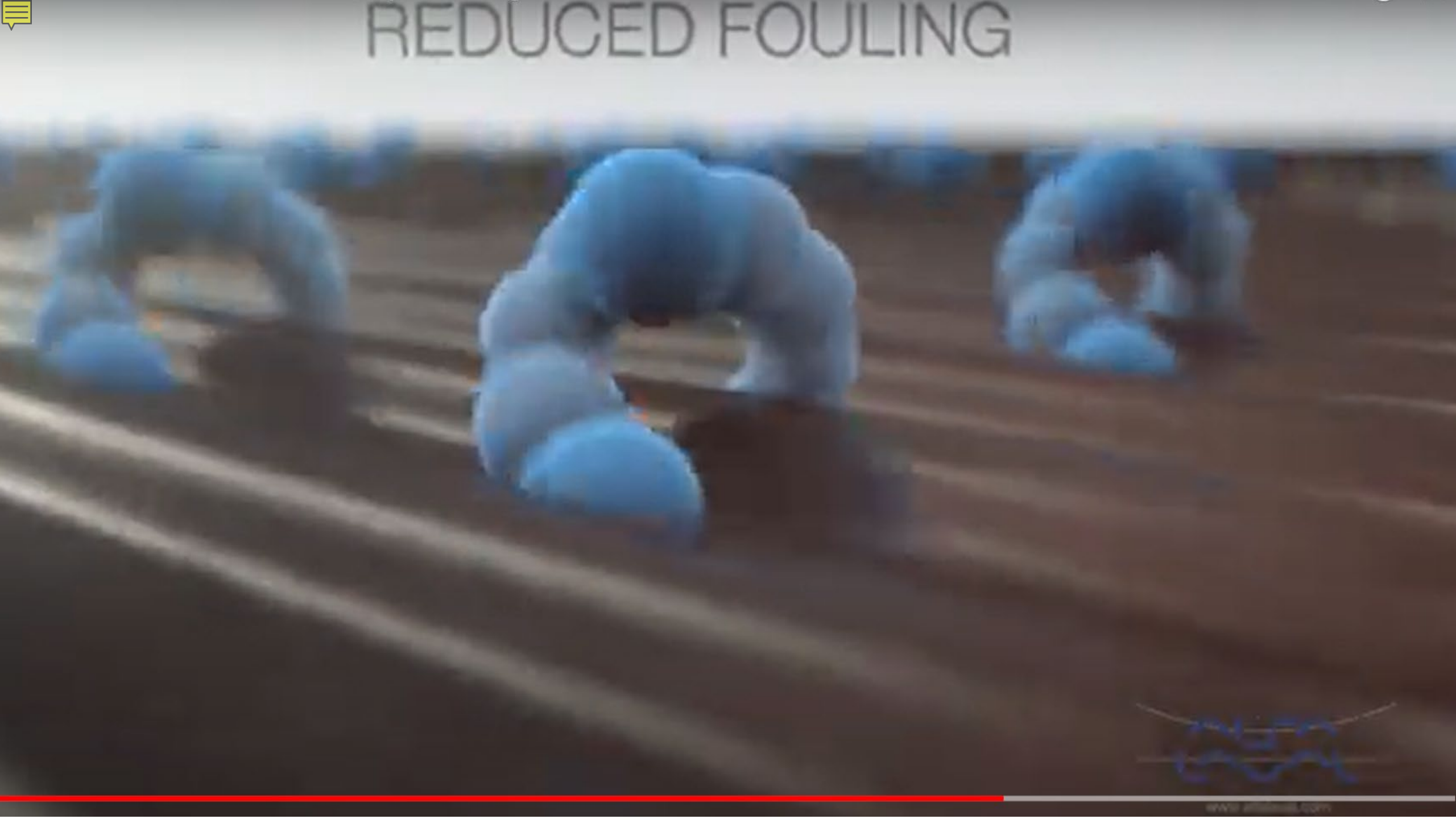
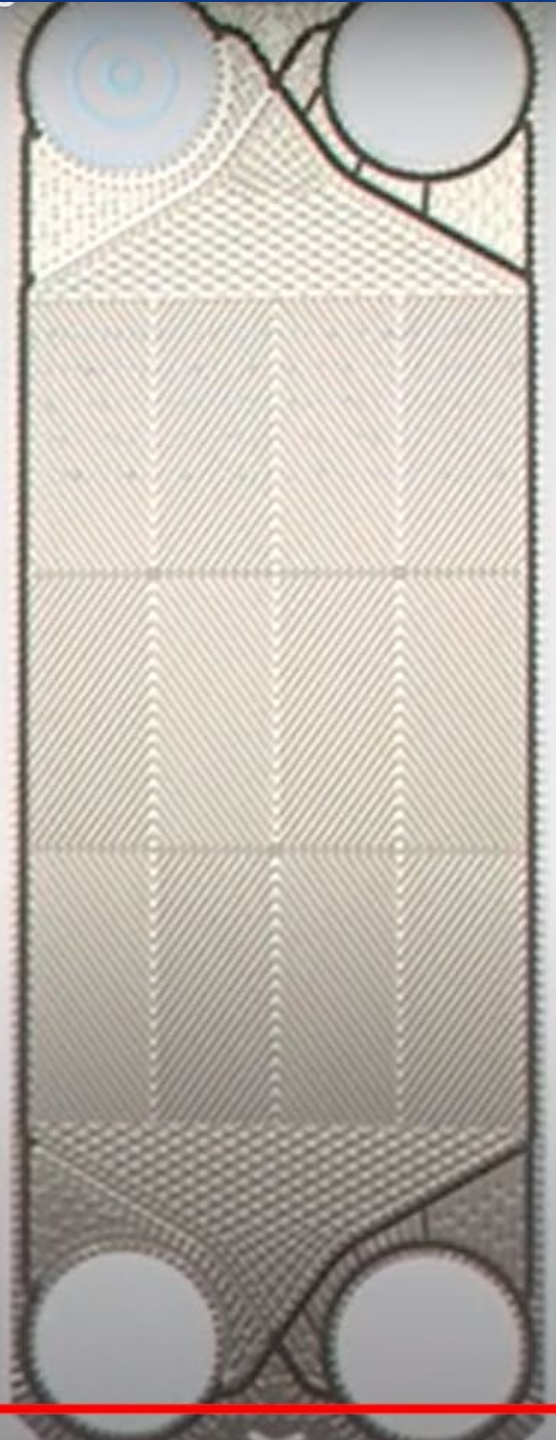



EXCELLENT FLOW DISTRIBUTION


REDUCED FOULING

ENERGY SAVINGS

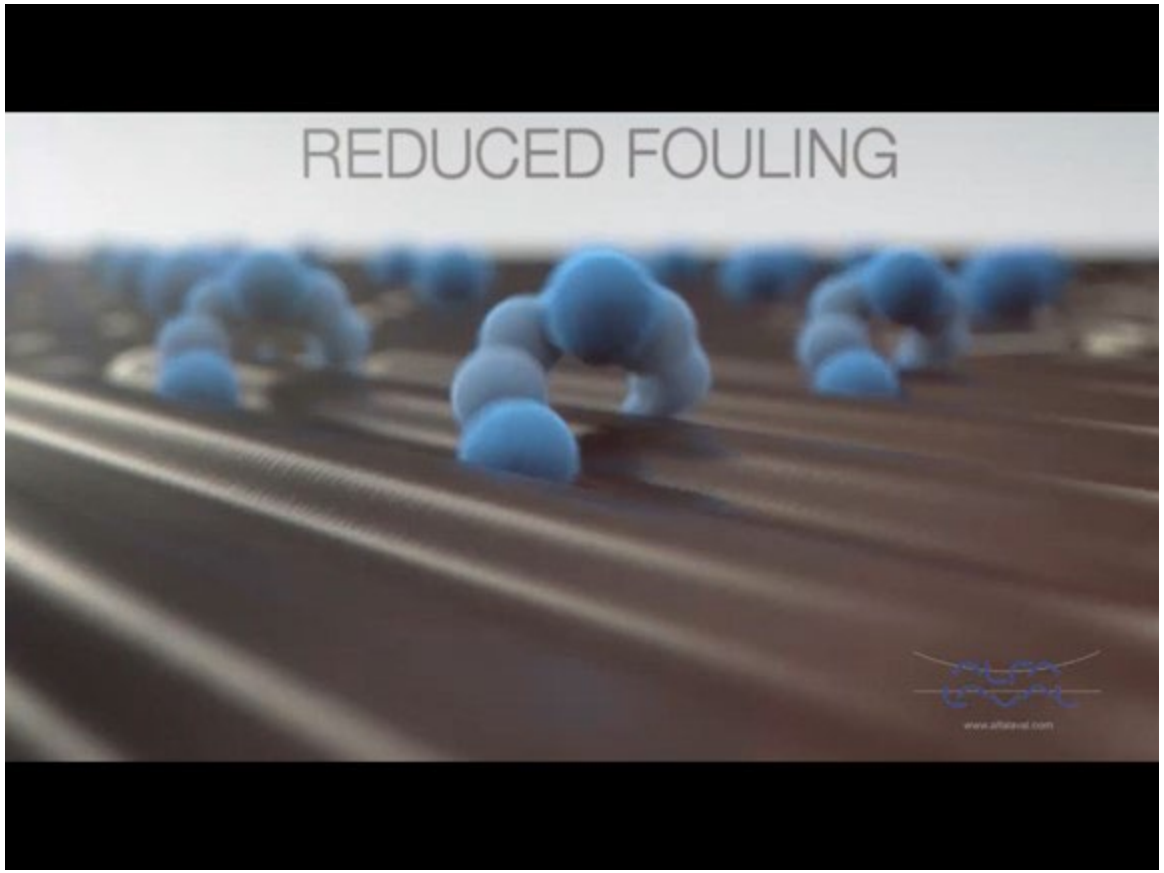
REDUCED MAINTENANCE



Important to get the design working

- Important with proper flow for……..

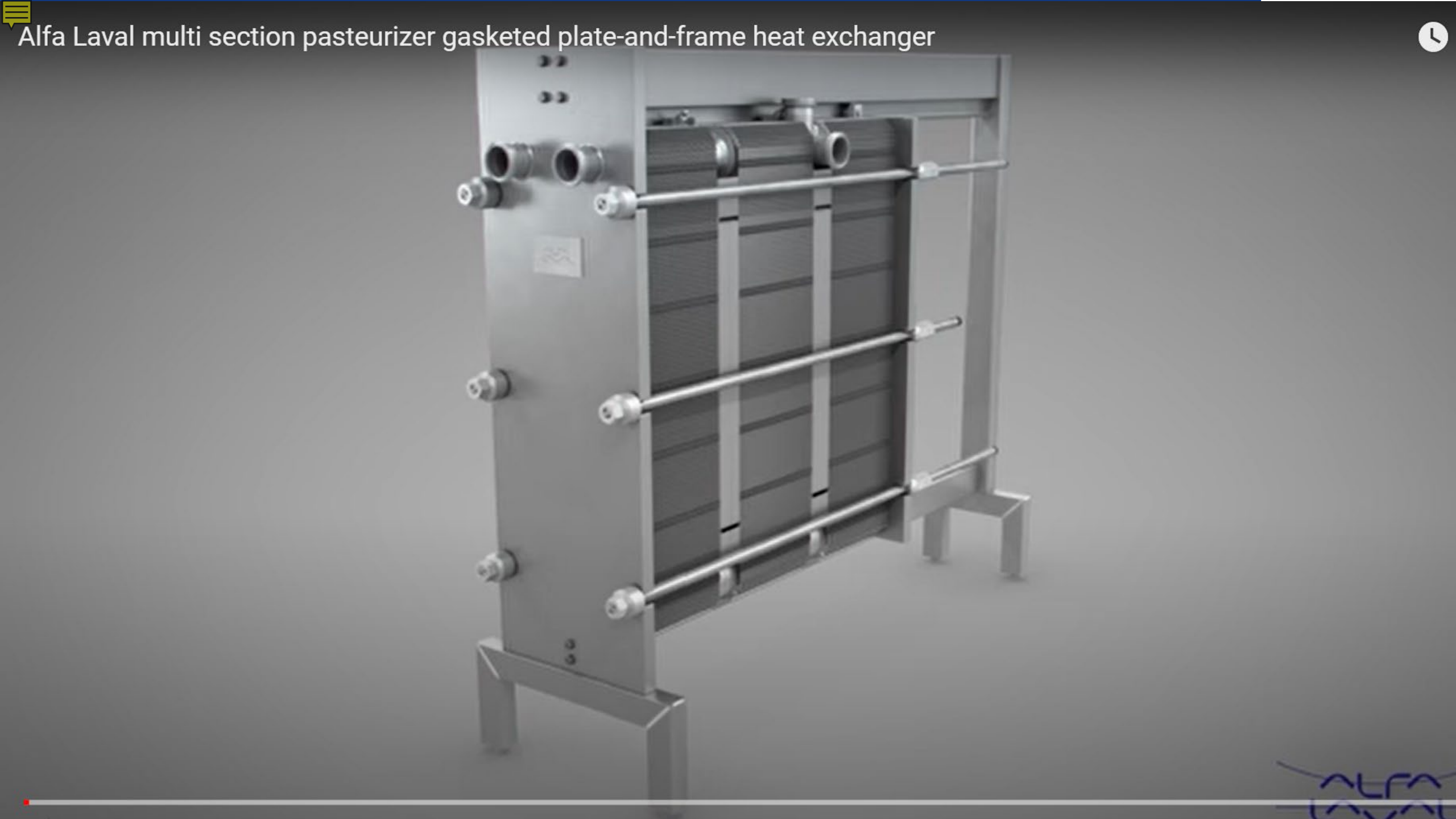
- Excellent Flow Distribution
- Reduced Fouling
- Energy Saving
- Reduced Maintenance

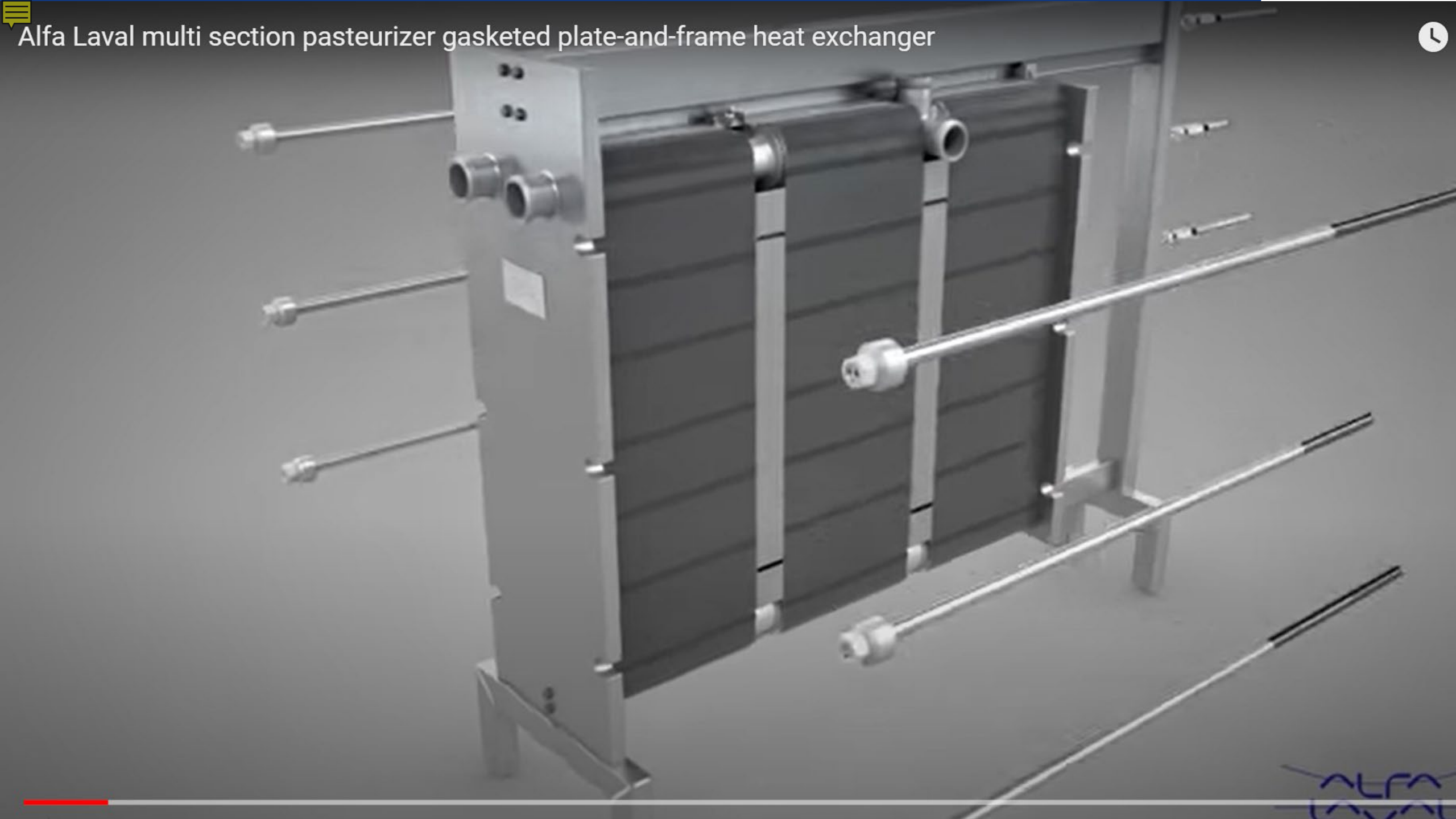


MPHE in operation

- Several heat exchanging processes in one frame

https://www.youtube.com/watch?v=6IJLVjpLPb8


Alfa Laval multi section pasteurizer gasketed plate-and-frame heat exchanger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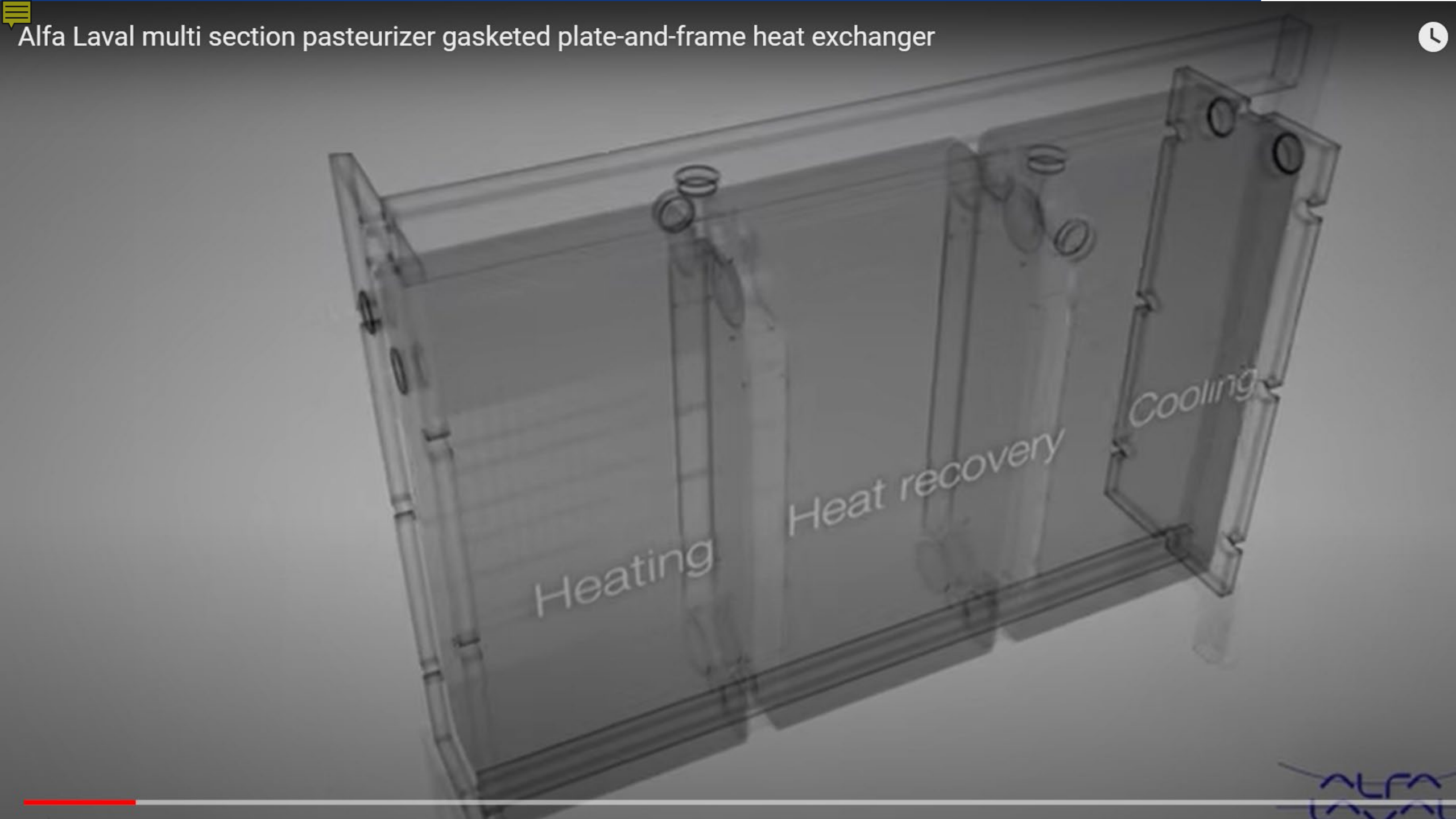
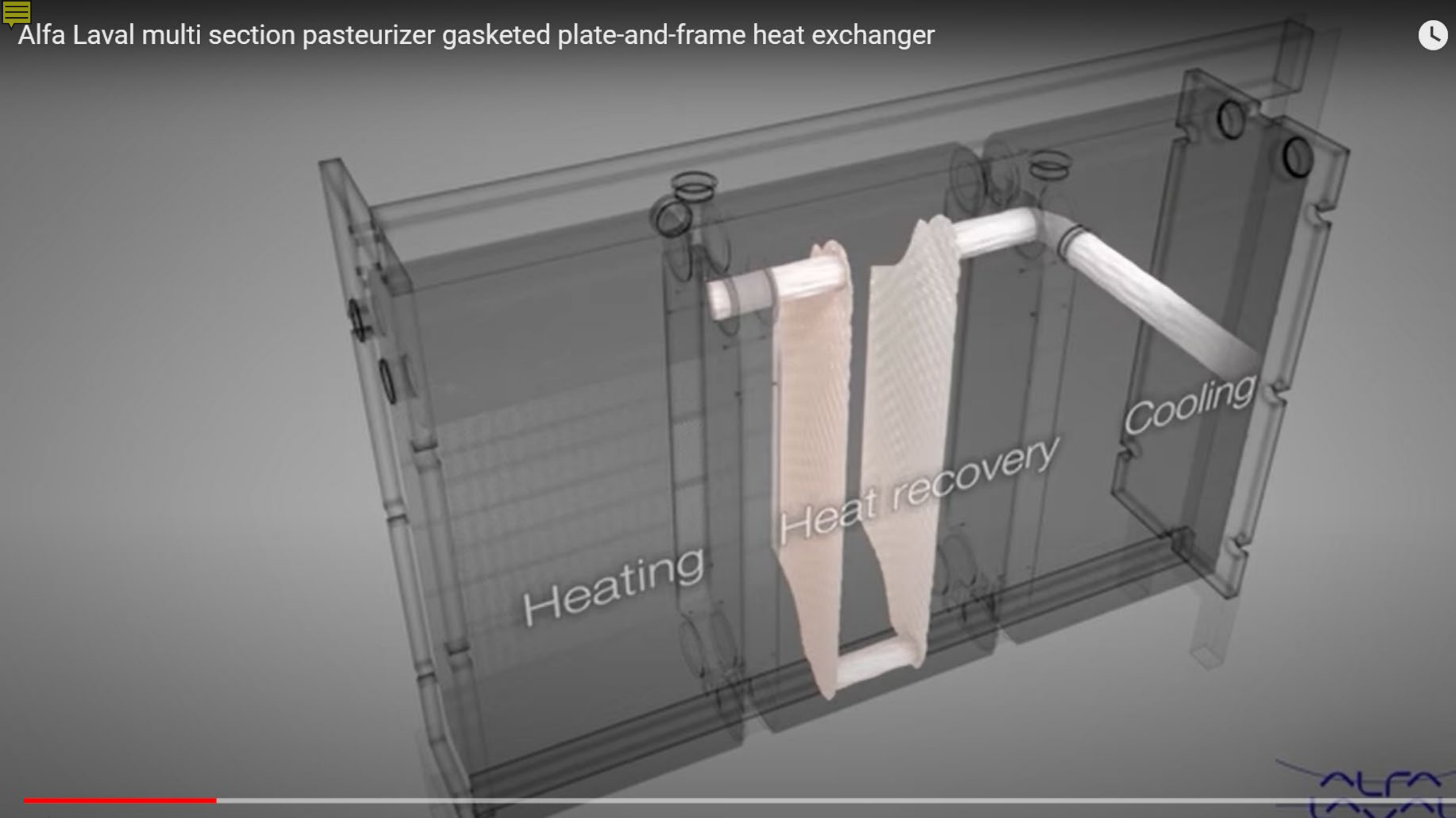

Alfa Laval multi section pasteurizer gasketed plate-and-frame heat exchanger
Heating
Heat recovery
Cooling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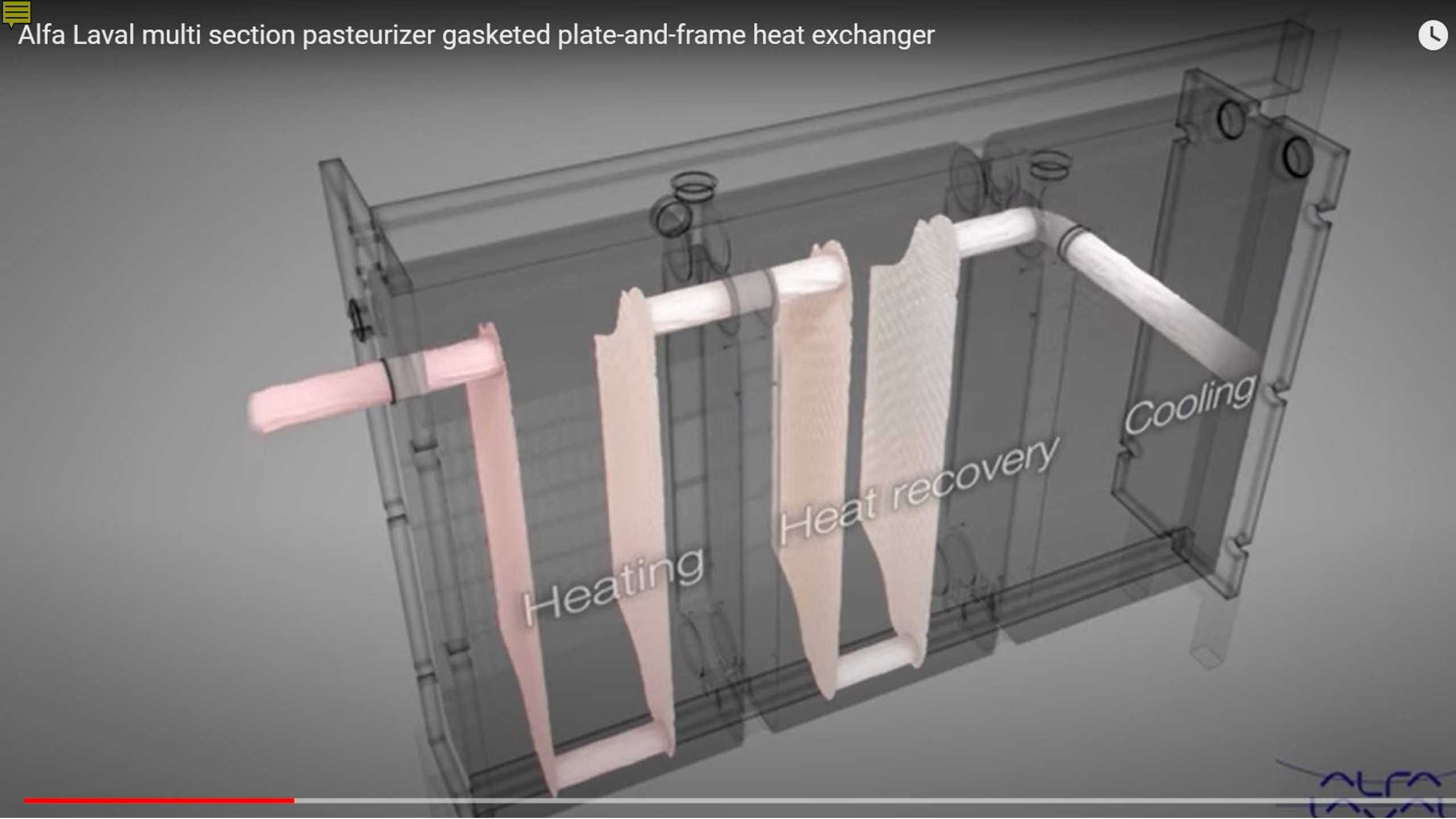
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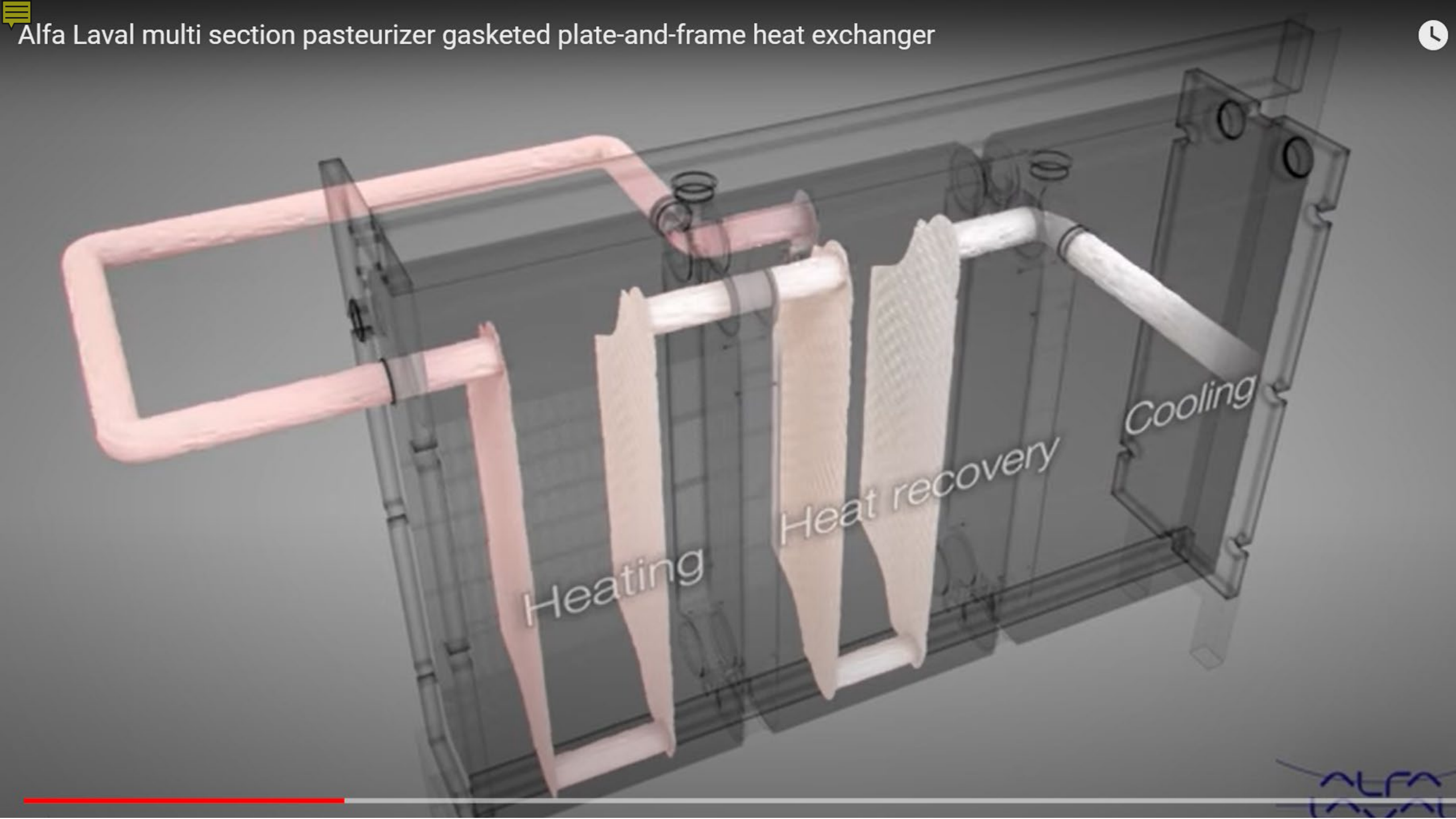
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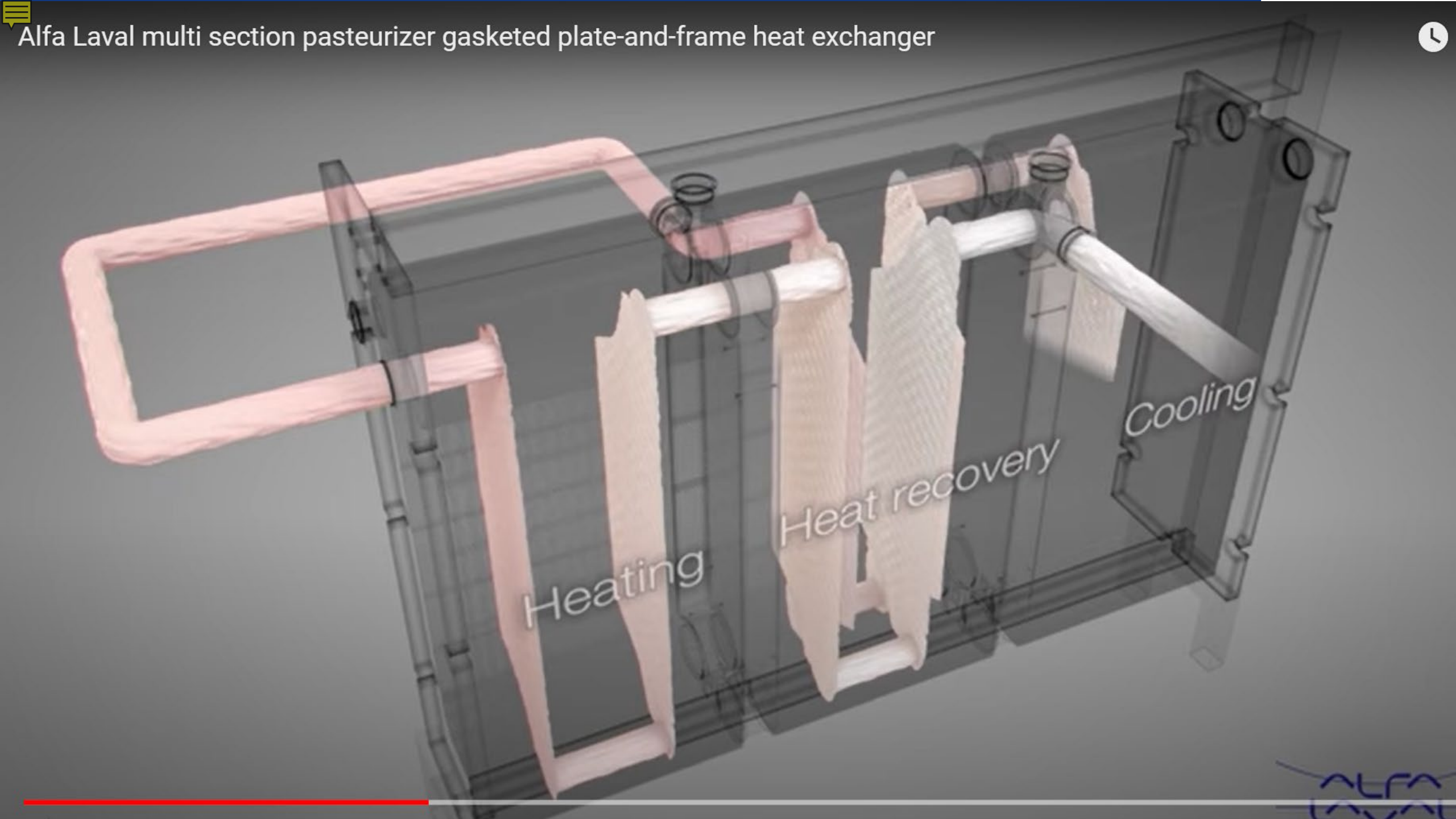
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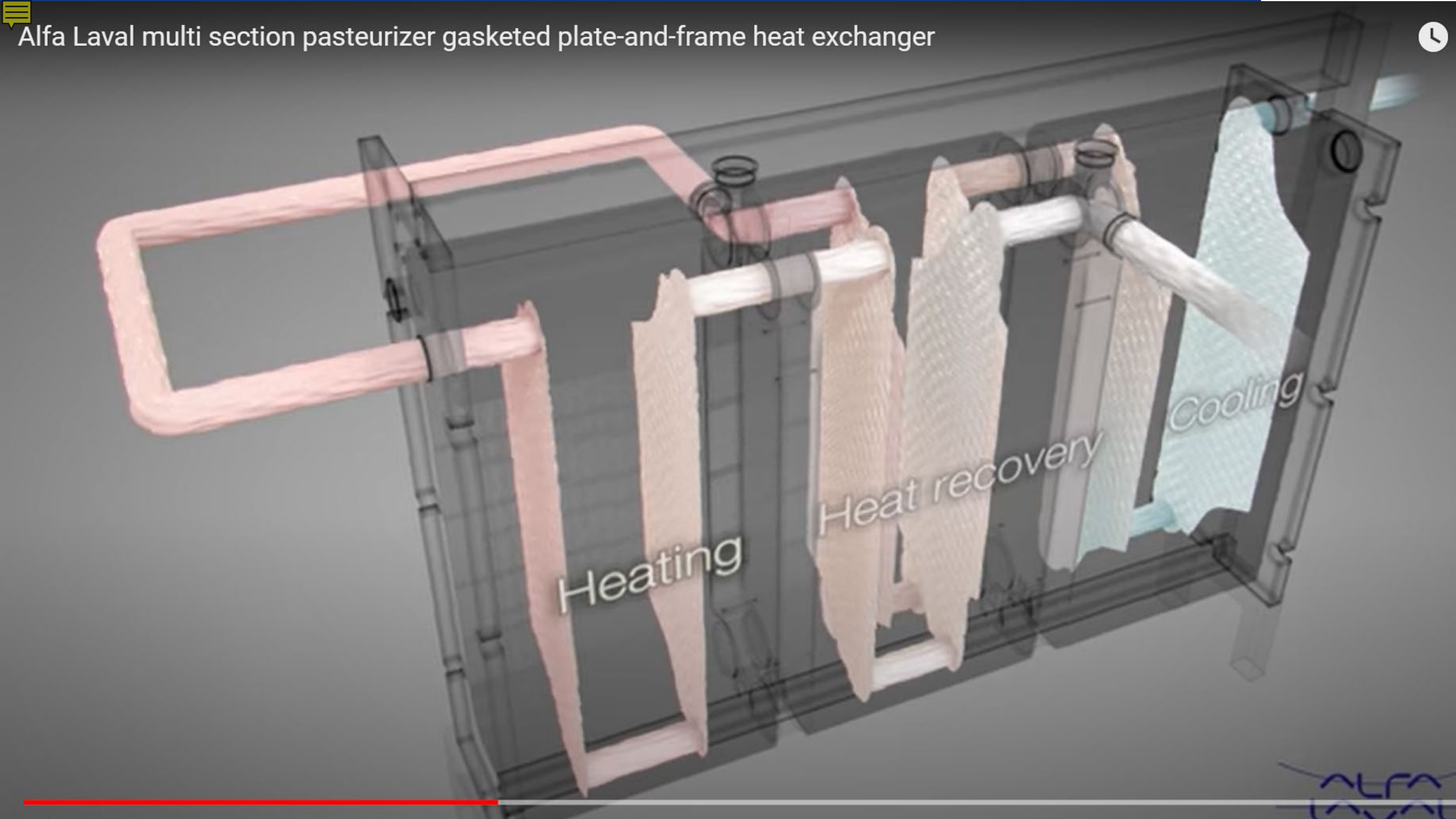
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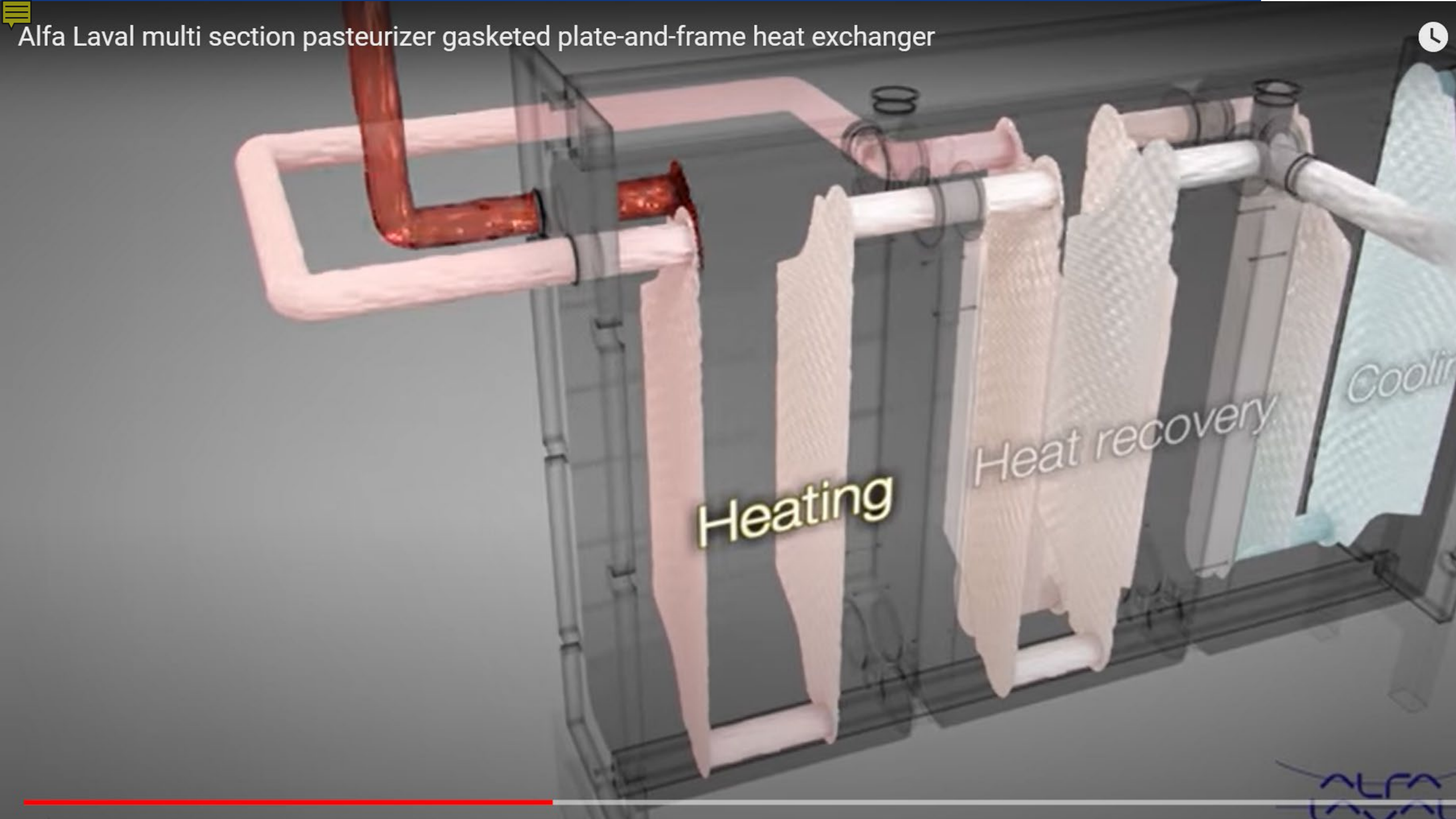
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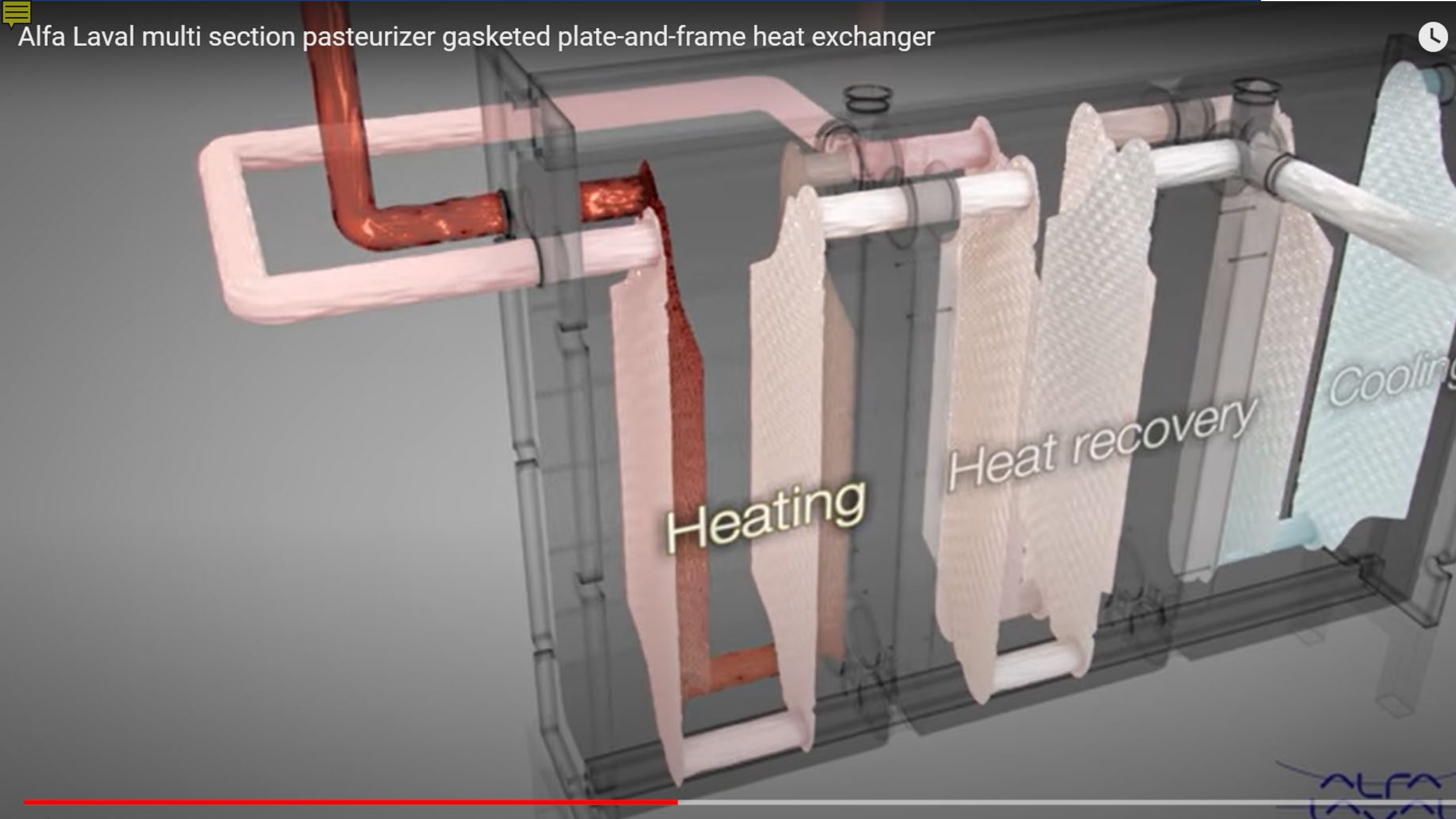
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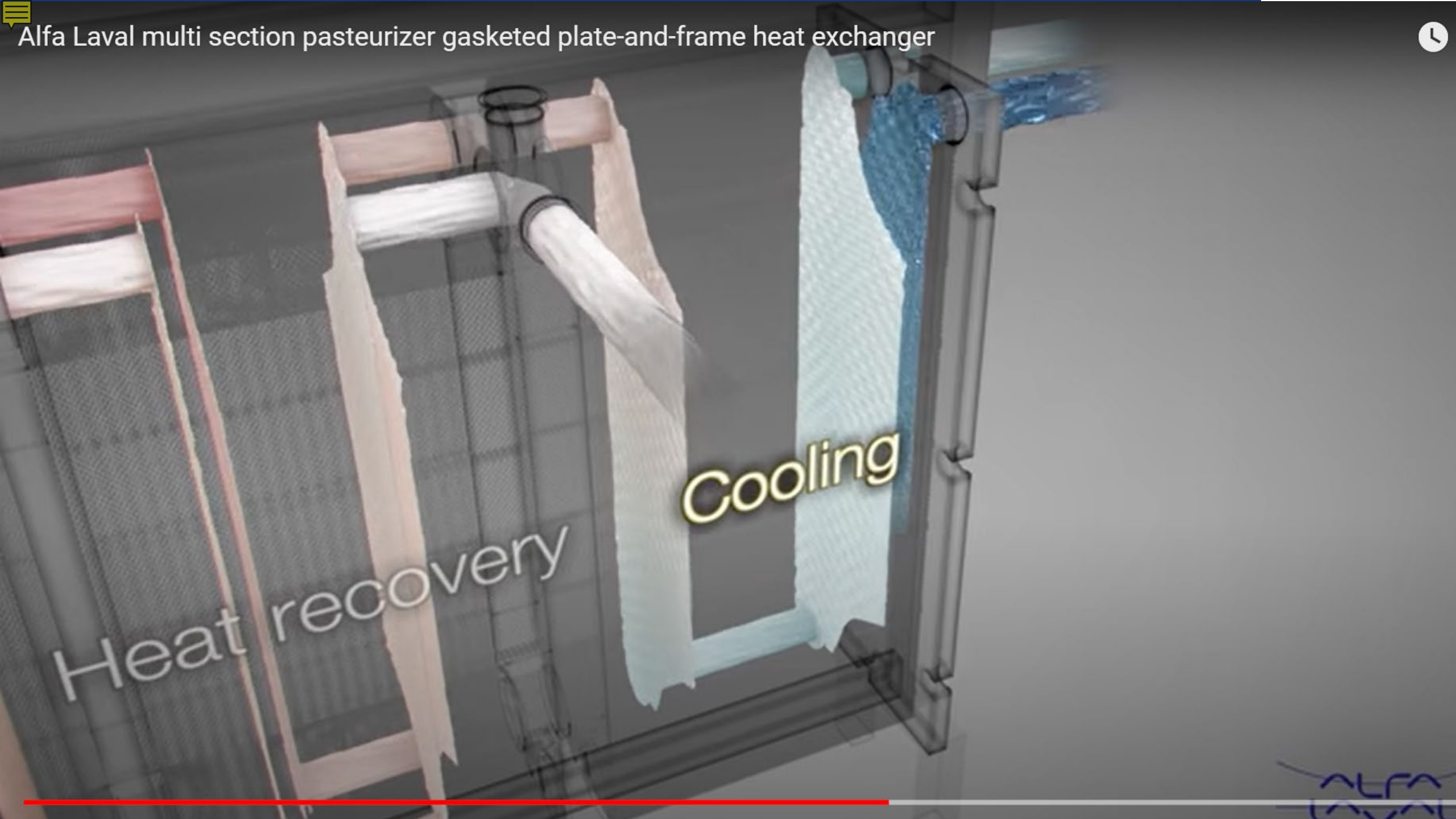
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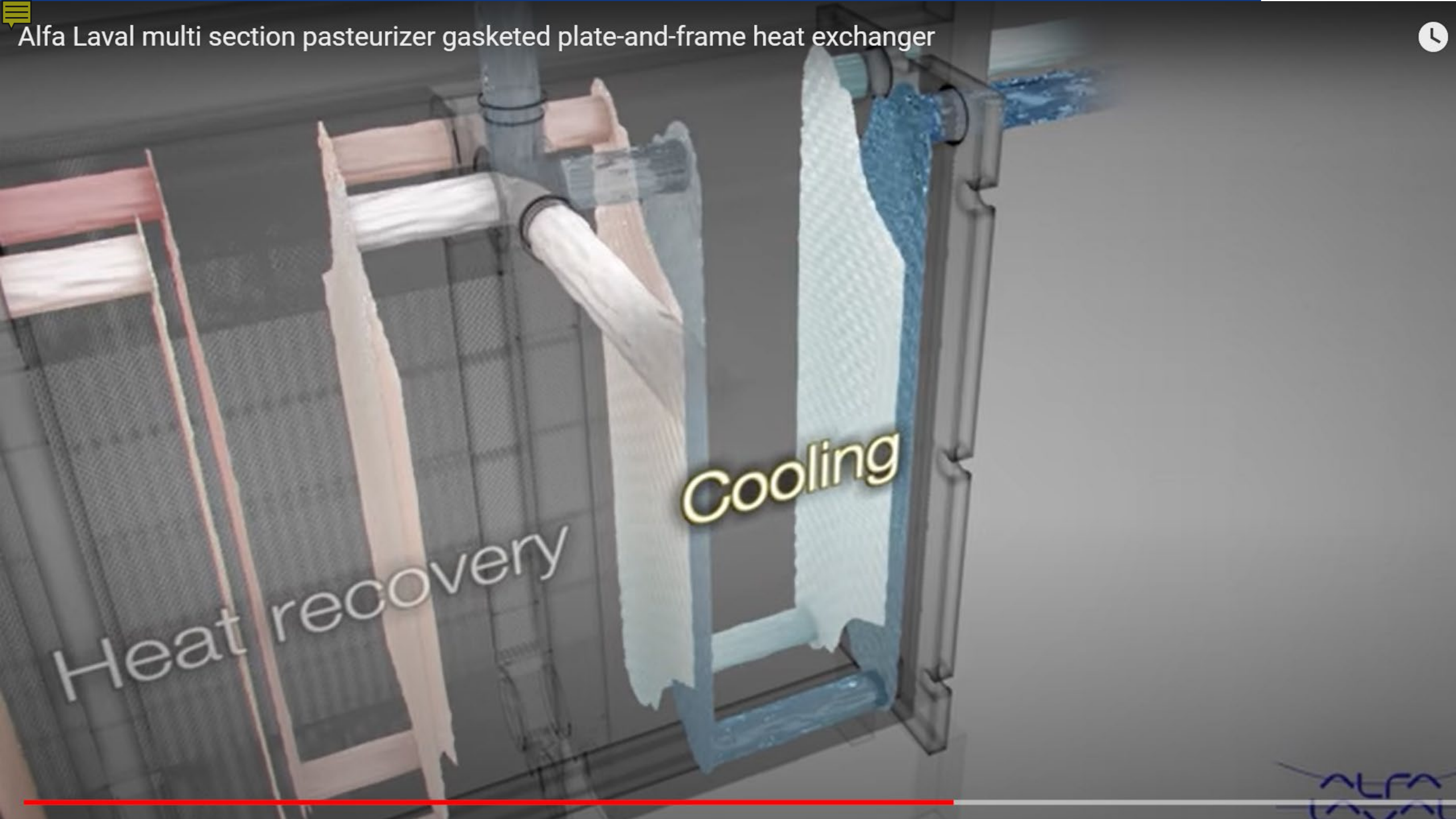
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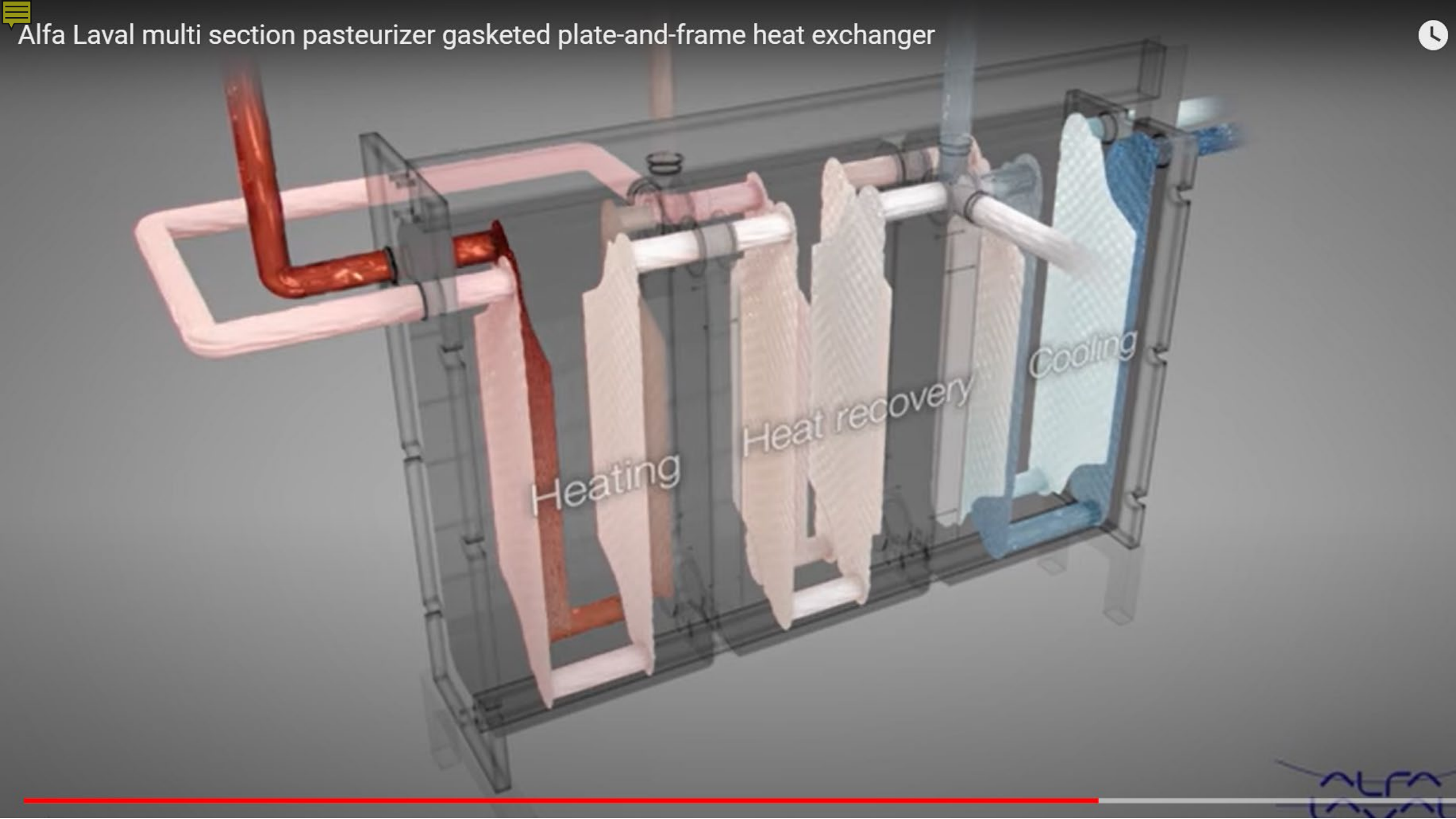
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Cooling


Alfa Laval multi section pasteurizer gasketed plate-and-frame heat exchanger

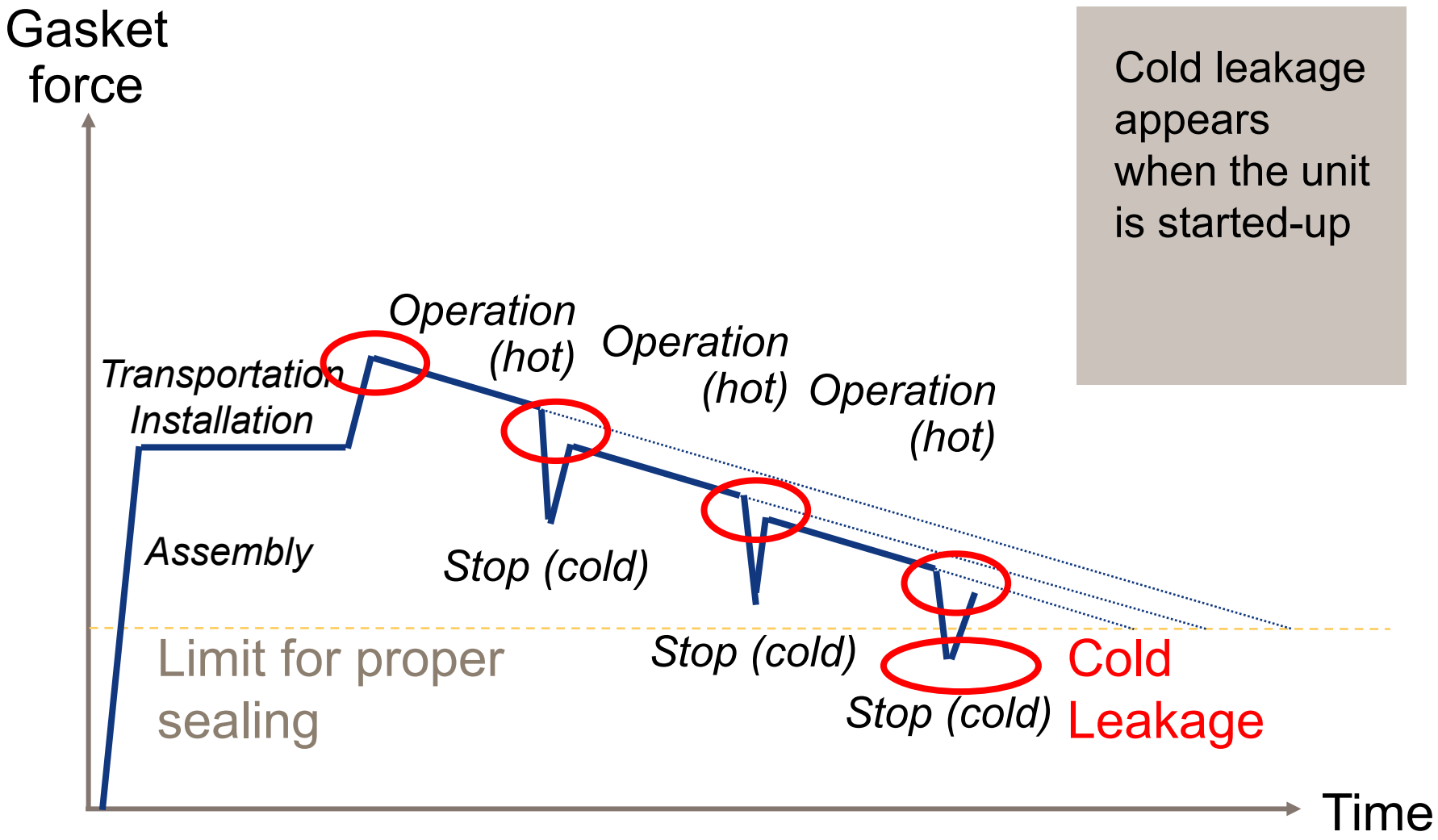
Gasket lifetime

– What decides the lifetime

- Gasket polymers chosen depending on the media
- Operating temperature – the rubber deteriorates
- Operating pressure
- Operating media swelling or softening by absorption of chemicals in the fluids
- Ambient - Hardening by attack of oxidising agents (e.g., oxygen in air)
- Opening frequency
- Cleaning liquids

Gasket Ageing

– The time and the rubber relaxation process



Cold leakage appears when the unit is started-up

When it is heated up it seals again

Opportunity: Gaskets probably need to be replaced at next planned stop

PHE Start & Stop

– Be smooth

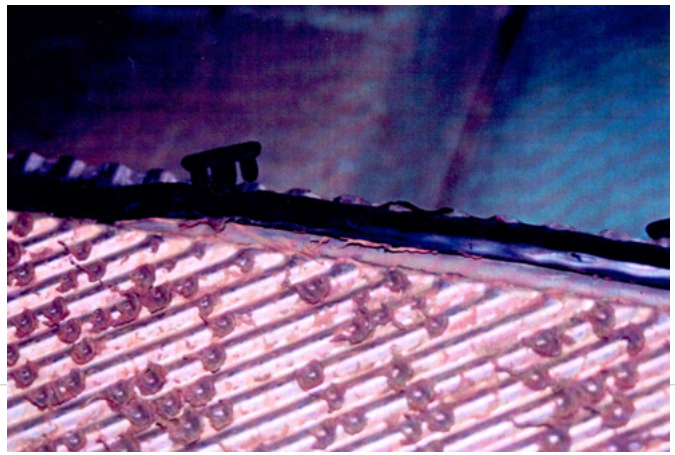
If several pumps are included in the system, make sure that you know which one to activate (start) or deactivate (stop) first

Note!

The flow rate should be adjusted slowly when opening the valves to avoid the risk of water hammer or

gasket blowouts.

Or under-pressure when closing the valve.



This can cause great damage to the equipment.

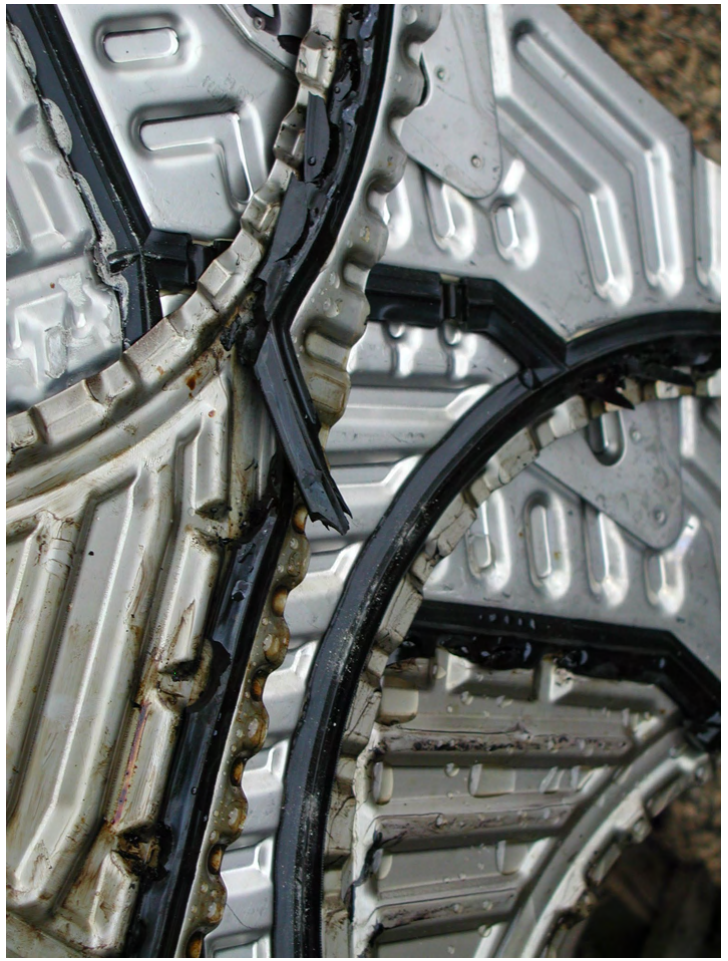
When NEW Gaskets in the GPHE

– Heat up slowly

Note!

Avoid rapid temperature changes in the PHE.

With media temperatures over 100°C, slowly increase the temperature preferably at least for one hour.



Insruction Manuals
https://www.alfalaval.com/service-and-support/product-services/plate-heat-exchanger-services/foodandbeverage/

Alfa Laval Hygienic line – H4

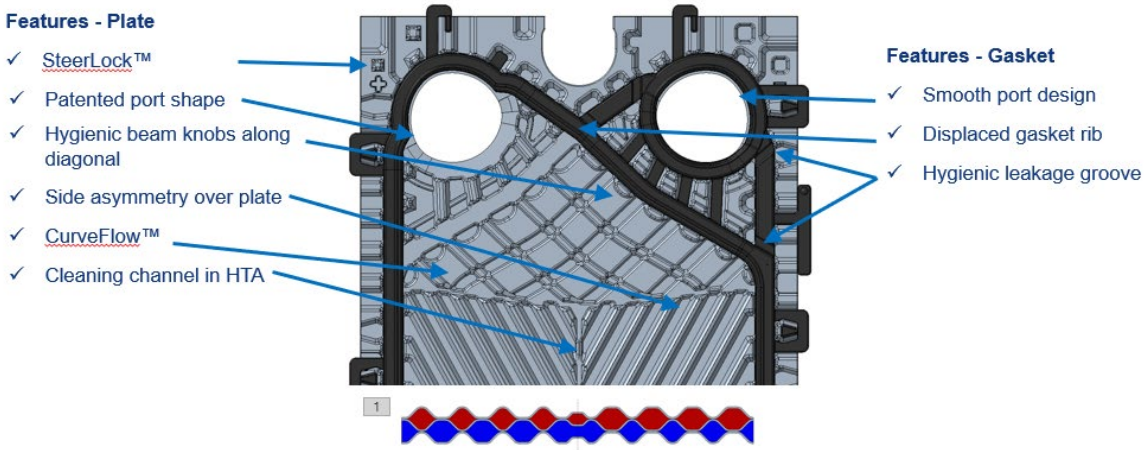
– Gasketed plate heat exchangers with a purpose

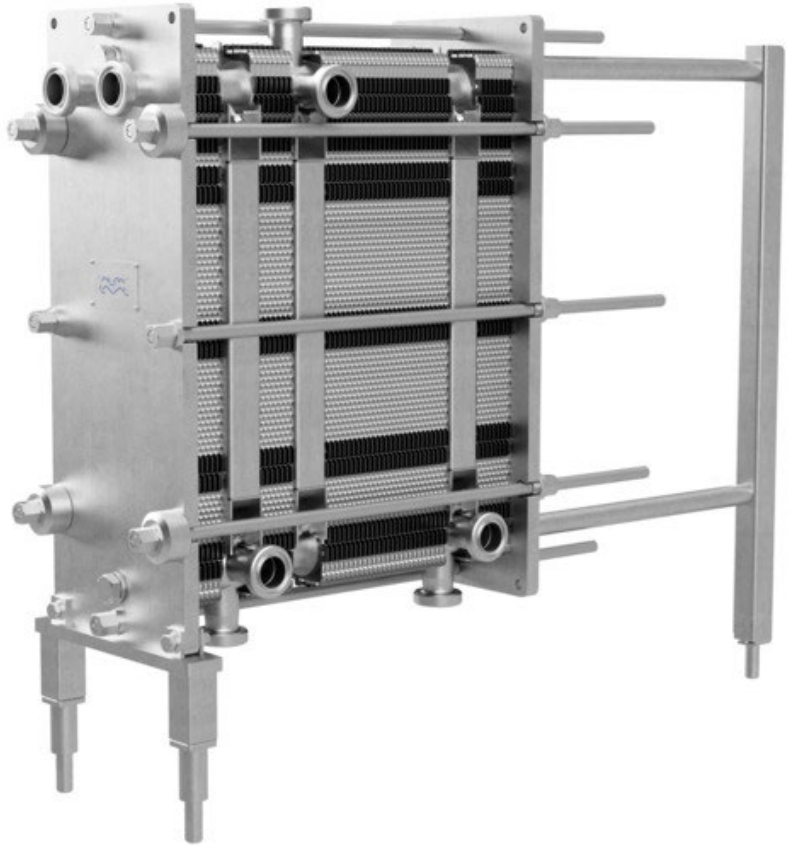
Mats Forslund

New Alfa Laval hygenic series

– H4 first out

- The first model out in 2021
  - More models follow until 2025
- Hygienic improvements
- New features on plate and gasket
  - patent protected
  - Even more features on later and bigger models





H4-P in Brewery

– Perfect fit in a Flexitherm

Break

Take a Break

10 minutes

Run Longer, Safer and Better with Alfa Laval

– Life Cycle Services

Integrity Test

VCA

Monitoring services

- Condition audit
- Condition monitoring
- Performance audit

Improvement services

- Equipment upgrades
- Redesign
- Replacement and Retrofit

Support services

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Start-up services

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Maintenance services

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- Service kits
- Service tools
- Exchange

Run Safer,
Run Smarter,
Run Better.

Alfa Laval Integrity Testing

Alfa Laval Integrity Testing

Delivering safety, accuracy, sustainability and speed

The Maintenance Challenge

Gasketed plate heat exchangers are robust, long-lasting pieces of equipment but after prolonged use, plates can develop cracks and gaskets can wear out.

- Unexpected shutdowns negate careful planning
  - Unpredictability can lead to unfulfilled orders, missed deadlines, lack of productivity.
- Disruptions are costly
  - Intrusive testing (eg. opening up plate packs) costs time and money.
- Loss of product can be catastrophic
  - Entire batches of product can be lost via contamination or production delays.
- Employee safety may be jeopardised
  - …if high temperatures or hazardous chemicals are involved

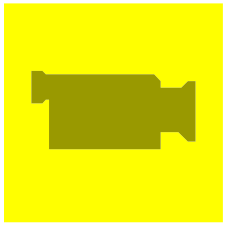
The Alfa Laval Integrity Test

– a preventive approach to product safety

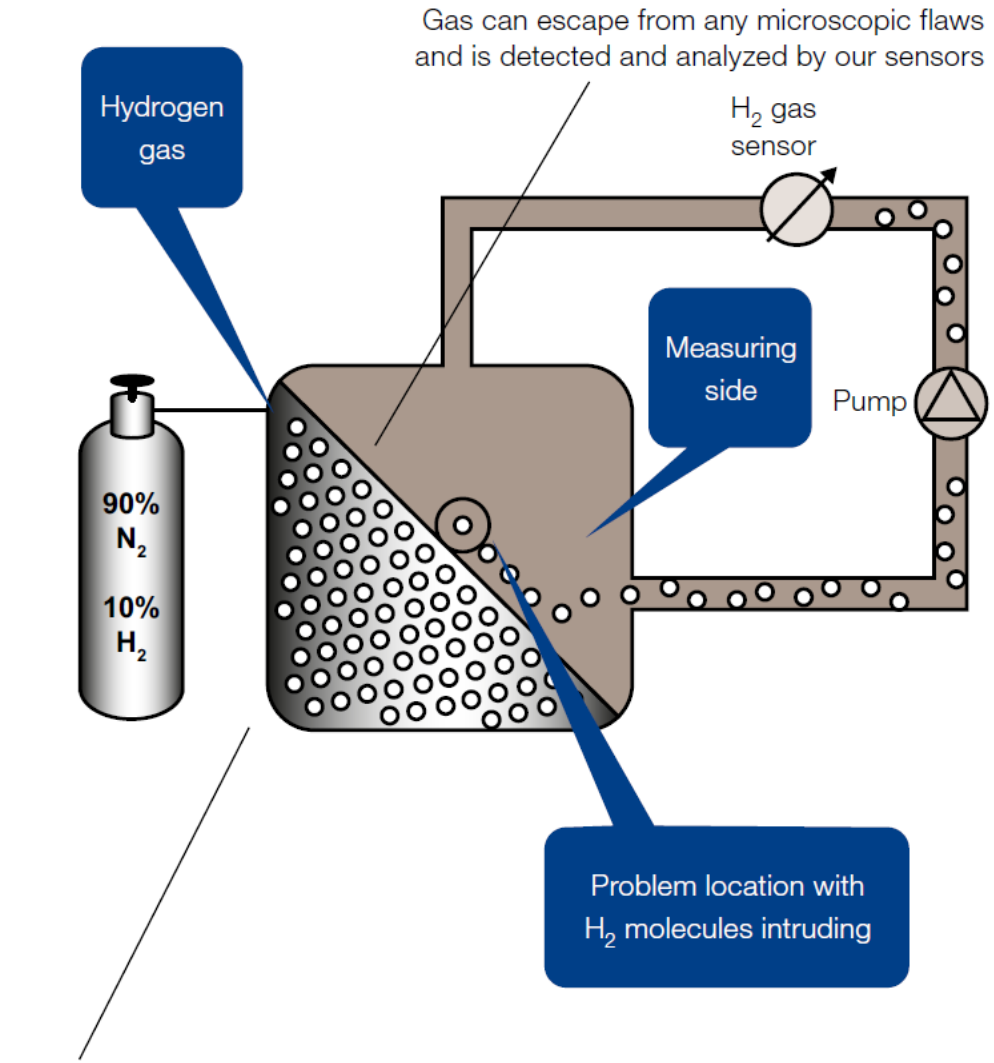
- Identifies potential leakages **before** they occur
- Reveals plate condition **without opening** the pack and with **minimal downtime**
- Secures product **quality** and **safety**
- Improves **reliability** and **productivity**

How the Alfa Laval Integrity Test works

- A fault detection method that's safe, accurate, sustainable and quick

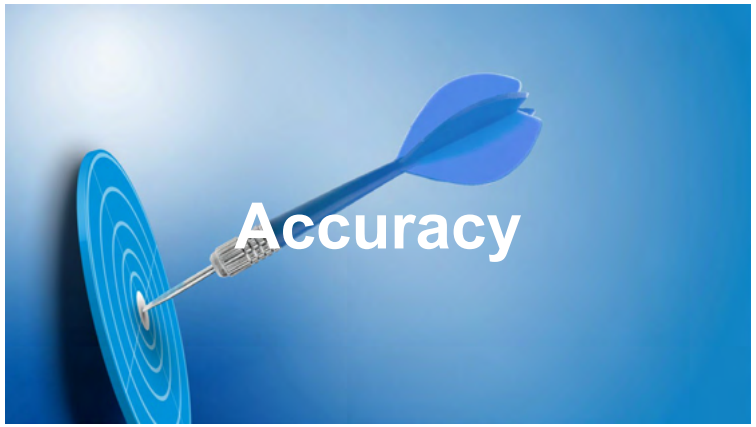


Integrity Test Video

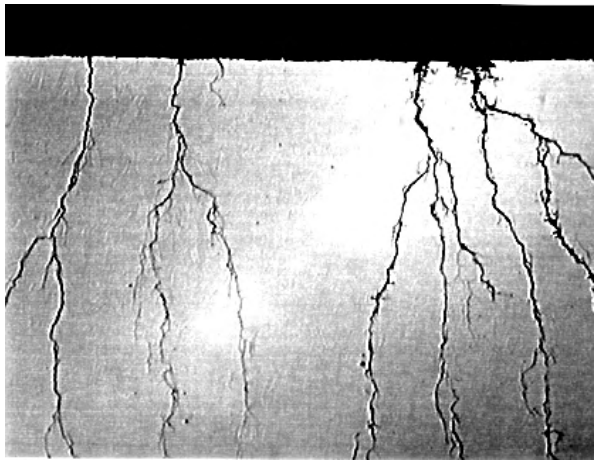


The key advantages

Monitor and protect your gasketed plate heat exchangers with improved…



Protects against destructive leaks by anticipating them



Heat exchanger plates and gaskets degenerate over time

↓

Corrosion, erosion, gasket fatigue, and microscopic cracks develop

↓

Leakages occur causing contamination and loss of product

Prioritizing **operational safety**

- **Safe** and **Reliable** Mix of Hydrogen and Nitrogen
  - 5-10% Hydrogen, *q.s.* Nitrogen – the ideal tracer gas mix
- Effectively **inert** – no possibility of reaction with media inside heat exchanger
- **Non-toxic** (approved by food industry E949)
- **Non-flammable** (ISO 10156 classified)
- **Non-corrosive** and **stress free**

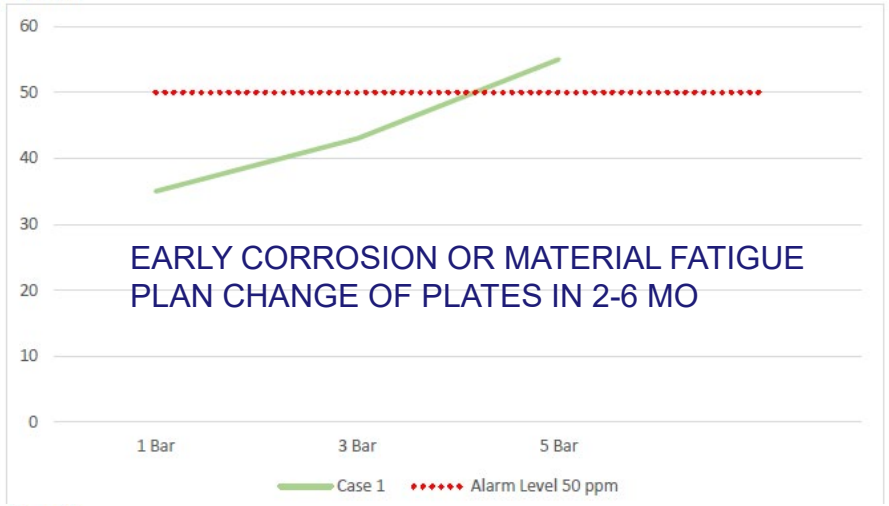
The precision method of assessing plates and gaskets

- Use of hydrogen as a tracer gas allows for accurate analysis

- Can detect faults which liquid can not
- Highly sensitive hydrogen ‘sniffer’ identifies potential leakages
- Hydrogen has very low background concentration, so there is no risk of false positives (0.5 ppm)
- The system is fully automated to avoid operator error
- Alfa Laval provide written documentation and certification confirming the condition of the heat exchanger plates
- So accurate, it can identify the **type** of plate or gasket flaw

Identifying the type of fault

Case 1

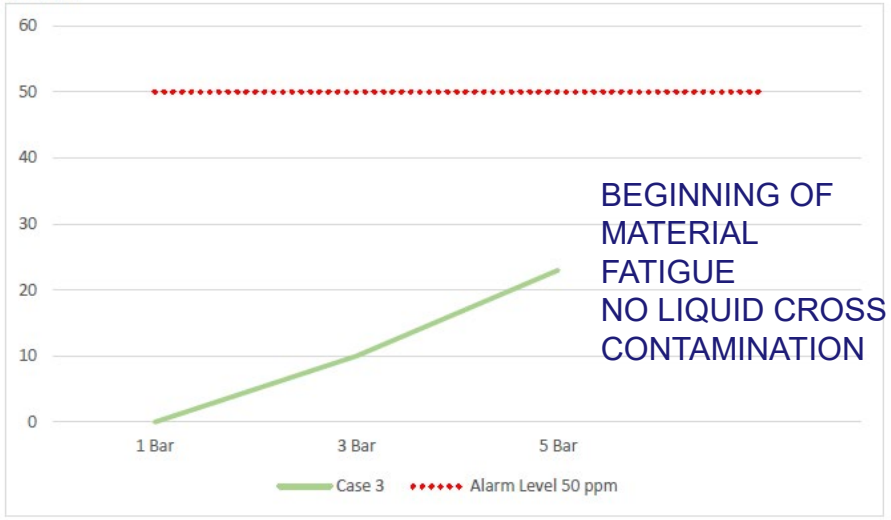


EARLY CORROSION OR MATERIAL FATIGUE
PLAN CHANGE OF PLATES IN 2-6 MO

Case 2

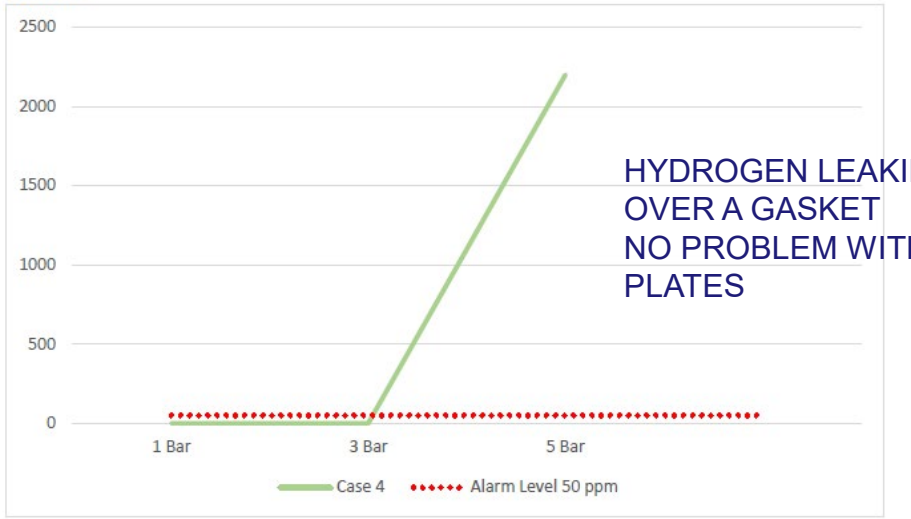
PLATE CRACK OR MANY
MICRO CRACKS
PLATE SHOULD BE
CHANGED

Case 3



BEGINNING OF
MATERIAL
FATIGUE
NO LIQUID CROSS
CONTAMINATION

Case 4



HYDROGEN LEAKING
OVER A GASKET
NO PROBLEM WITH
PLATES

The precision method of assessing plates and gaskets

- How Alfa Laval Integrity Testing compares to other testing methods

How the Alfa Laval method compares with other field tests	**Inspection range / failures**					
Methods – field testing	Plate cracks	Micro cracks >30 µm	Micro cracks <30 µm	Corrosion	Fatigue	External gasket leakage
Water pressure test	✓	✗	✗	✗	✗	✗
Conductivity test	✓	✗	✗	✗	✗	✗
Tracer fluid test	✓	✓	✗	✗	✗	✗
Field dye test*	✓	✓	✓	✗	✗	✗
Field Helium test**	✓	✓	✓	✗	✗	✗
Alfa Laval Integrity Test	✓	✓	✓	✓	✓	✓

*Introducing substance that require cleaning afterwards.
**Require vacuum & risk for background contamination.

Minimal disruption, minimal downtime

- A primary benefit of the Alfa Laval Integrity Test is the **avoidance of unplanned shutdowns**
  - Awareness of the condition of your gasketed plate heat exchangers lets you **plan production** more effectively
  - A **proactive approach** lets you arrange testing and maintenance to suit your production schedule
  - Avoids lost production through **unscheduled** or **unexpected downtime**

Minimal disruption, minimal downtime

- The Alfa Laval Integrity Test offers **quick, convenient, and non-intrusive** testing
  - Suitable for units in **difficult to access** locations
  - Units **do not require** disassembly, reassembly or cleaning
    - No need to **clean** heat exchangers after testing – hydrogen dissipates quickly without residue
  - Doesn't require unit to be **drained** completely
  - **No waiting time** required between tests
    - Only 15 minutes to test each section
    - Immediate test results

Minimal disruption, minimal downtime

- Unlike alternative methods, the Alfa Laval Integrity Test does **not** necessitate

  - Vacuum to remove tracer gas
  - Waiting period between tests to allow for tracer gas dispersion

  } Necessary for Helium-based method

  - Disassembly of plate packs
  - Cleaning after test procedure

  } Necessary for dye-penetrant method

Run Longer, Safer and Better with Alfa Laval

– Life Cycle Services

Integrity Test

VCA

Monitoring services

- Condition audit
- Condition monitoring
- Performance audit

Improvement services

- Equipment upgrades
- Redesign
- Replacement and Retrofit

Support services

- Exclusive stock
- Remote support
- Technical documentation
- Training
- Troubleshooting

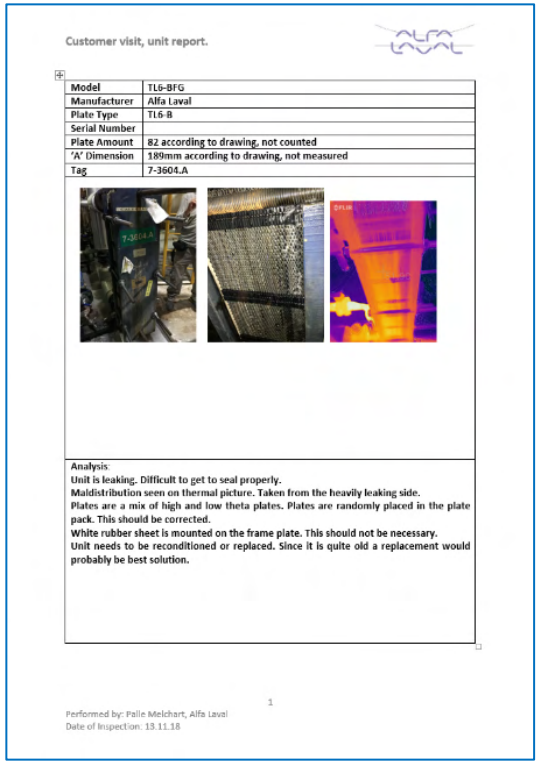
Start-up services

- Commissioning
- Commissioning supervision
- Installation
- Installation supervision

Maintenance services

- Calibration
- Preventive maintenance
- Reconditioning
- Cleaning services
- Repair
- Spare parts
- Service kits
- Service tools
- Exchange

Alfa Laval Visual Condition Assessment



Customer visit, unit report.

Model	TL6-BFG
Manufacturer	Alfa Laval
Plate Type	TL6-B
Serial Number	
Plate Amount	82 according to drawing, not counted
'A' Dimension	189mm according to drawing, not measured
Tag	7-3604.A

Analysis:
Unit is leaking. Difficult to get to seal properly.
Maldistribution seen on thermal picture. Taken from the heavily leaking side.
Plates are a mix of high and low theta plates. Plates are randomly placed in the plate pack. This should be corrected.
White rubber sheet is mounted on the frame plate. This should not be necessary.
Unit needs to be reconditioned or replaced. Since it is quite old a replacement would probably be best solution.

1

Performed by: Palle Melchart, Alfa Laval
Date of Inspection: 13.11.18

Why - Visual Condition Assessment

- You will get an overview of the current condition of your plate heat exchangers
- We will provide a report of our observations and findings
  - Plate heat exchanger data
  - Pictures of problem areas
  - Thermal image
  - Our findings and recommendations
- You will get short term and long term maintenance recommendations
- With our recommendations you can plan your maintenance
- We will give safety advice on the spot
- Visual Condition Assessment is executed swiftly

How - Visual Condition Assessment

- We will make a visual inspection, photos and thermal images
- We have conversation with you during the inspection
  - Here we get information about each plate heat exchanger (running conditions, reoccurring problems etc.)
- We know plate heat exchangers
  - To what can different operating conditions lead
  - What causes problems
  - Heat exchanger experts are available when necessary
  - Material experts in our lab in Sweden are also available to consult
    - Metal, rubber, chemicals
- Plate heat exchangers from other manufacturers are also included
  - Detail level depends on manufacturer

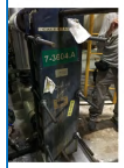
Report

Visual Condition Audit Plate Heat Exchanger

Customer:	XXX
Report generated:	2018-12-14
Prepared by:	Palle Melchart

tomer visit, unit report.

del	TL6-BFG
nufacturer	Alfa Laval
te Type	TL6-B
ial Number	
te Amount	82 according to drawing, not counted
Dimension	189mm according to drawing, not measured
	7-3604.A



lysis:
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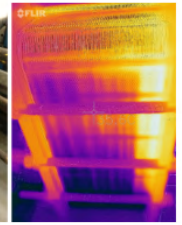
t needs to be reconditioned or replaced. Since it is quite old a replacement would
bably be best solution.

1

Performed by: Palle Melchart, Alfa Laval
Date of Inspection: 13.11.18

Customer visit, unit report.

Model	M10-BFG
Manufacturer	Alfa Laval
Plate Type	M10-B
Serial Number	
Plate Amount	120 according to drawing, not counted
'A' Dimension	366mm according to drawing, not measured
Tag	7-2751.A



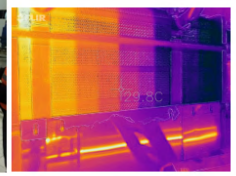
Analysis:
The frame is in decent condition.
Bolts are corroded, but not to a critical level.
The lower bolts have been turned around for easier access. This is a good idea. However, in this case the lower bolts, which are tightening bolts, have been shortened. As these are tightening bolts they must be used for even tightening of the plate pack. This is not possible with a short bolt.
Heat distribution is very poor. This is a cooler, so the CIP process will not clean efficiently since it is the heat exchanger itself they use to heat the cleaning solution. Recommendation is to somehow heat the cleaning solution.

5

Performed by: Palle Melchart, Alfa Laval
Date of Inspection: 13.11.18

Condition Audit
Heat Exchanger

el	Front10-FRM
ufacturer	Alfa Laval
Type	Clip10
Number	
Amount	Counted 289 (15+193+81) plates. Same as specification.
mension	Measured 1495 mm. 1501 mm according to drawing.

sis:
e is in very good condition.
mentioned they have had problems with the bolts in the frame plate holding the
ng bar. It seems they have solved this issue with new bolts.
nit is only slightly under tightened (6 mm).
distribution is very good.

Report: Visual Condition Audit Plate Heat Exchanger
Customer: XXX
Report generated: 2018-12-14
Prepared by: Palle Melchart

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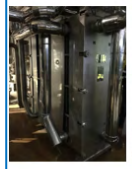
sual Condition Audit
ate Heat Exchanger

Model	Sigma 66 TDV
Manufacturer	API Schmidt-Bretten
Plate Type	?
erial Number	
Plate Amount	Did not count.
'A' Dimension	Measured 1420 mm. 1440-1422 mm according to name plate
Tag	



nalysis:
rame is in good condition, although there is a little corrosion on the connection plates.
roblem to get tightened after opening. Sometimes they need to open and close up to 10
mes before there is no leakage. The unit is tightened to minimum A-measure. There is
late deformation on the edges of plates where they sit next to connection plates.

ompared to Alfa Laval FrontLine:
lates: we do not have the same issues with deformation of edges due to a different
esign.
earing boxes: our units have bearing boxes on the tightening bolts to reduce stress on
he bolts and to make tightening the unit easier (less force is needed).
arrying bar (upper) and guiding bar (lower): These were of the round type were plates
re standing on the lower bar. In FrontLine frames the plates are hanging on the carrying
ar and are supported by the 5-point alignment system. This is a more rigid design.
onnection plates: It appears as the corners on this unit could not be changed. This is
possible on FrontLine if a design change is necessary.

Report: Visual Condition Audit Plate Heat Exchanger
Customer: XXX
Report generated: 2018-12-14
Prepared by: Palle Melchart

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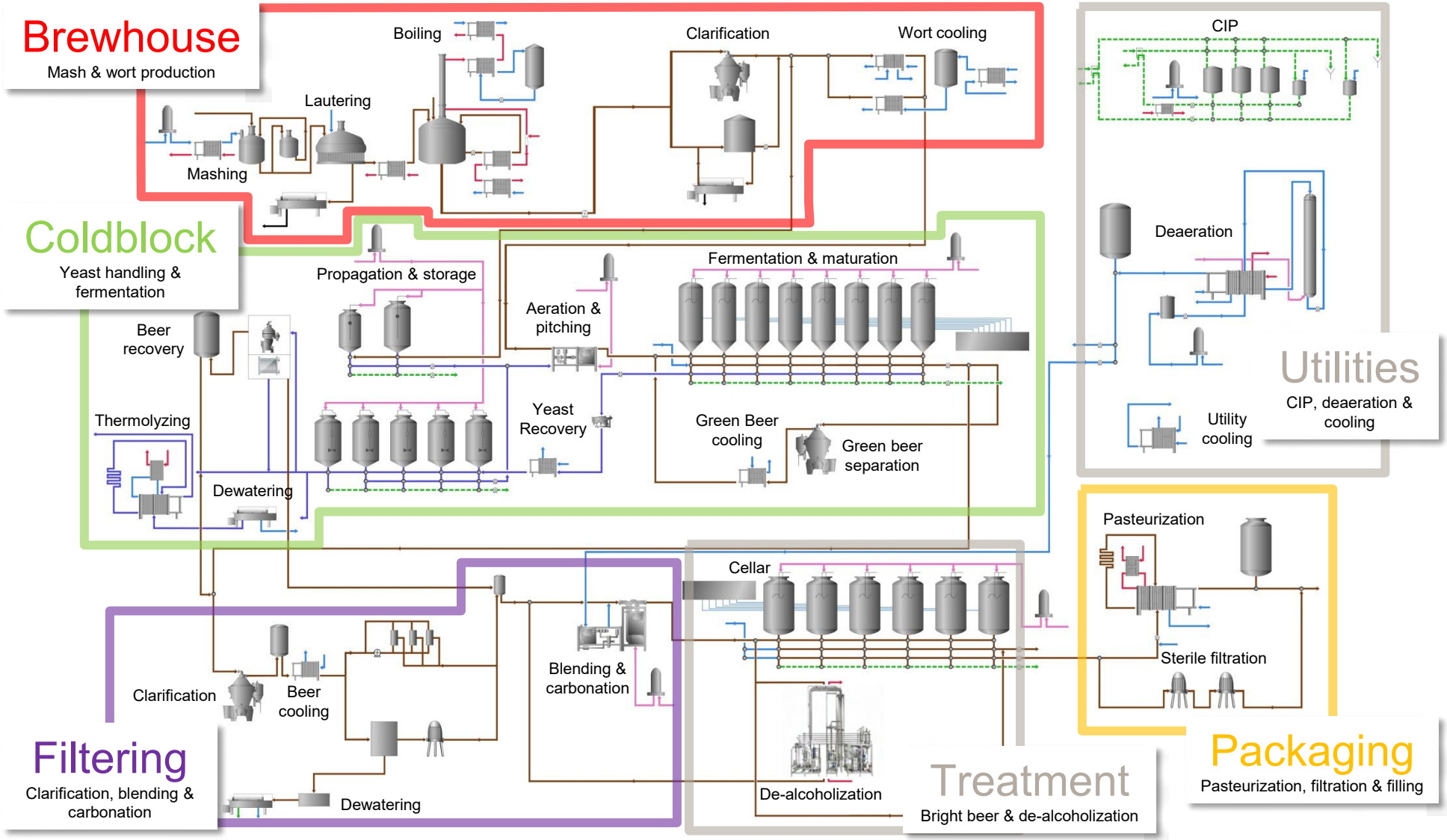
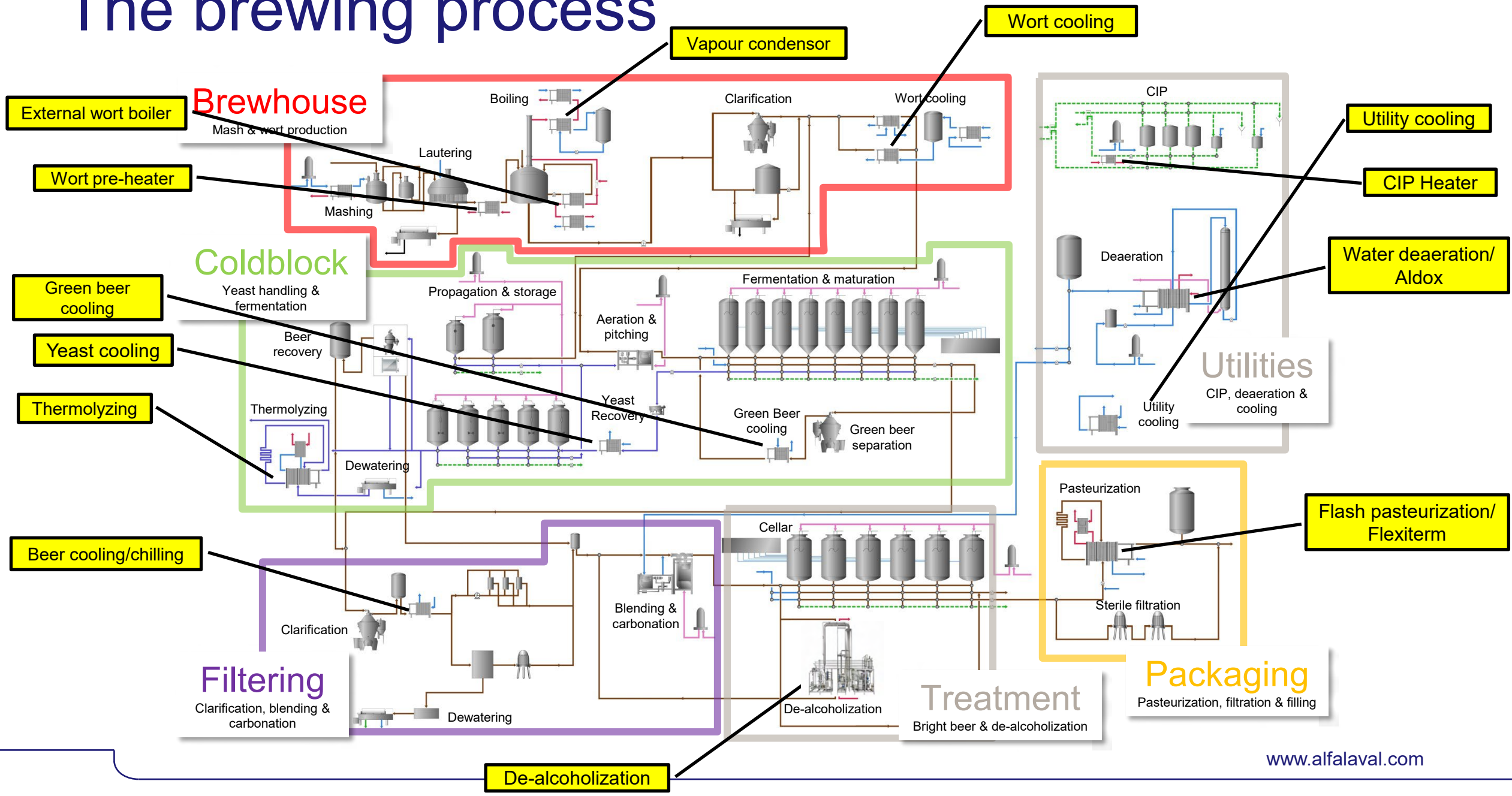
PHE in brewery

By Mats Forslund
Alfa Laval Service
July 2022

The brewing process

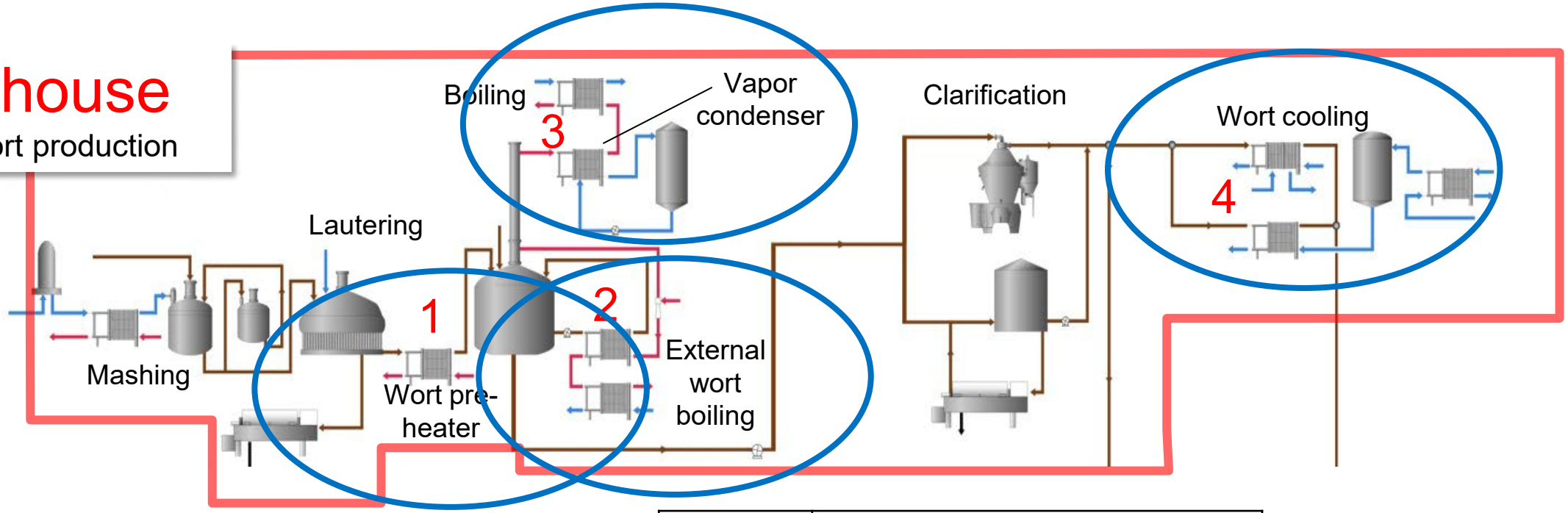


The brewing process



Brewhouse

Mash & wort production



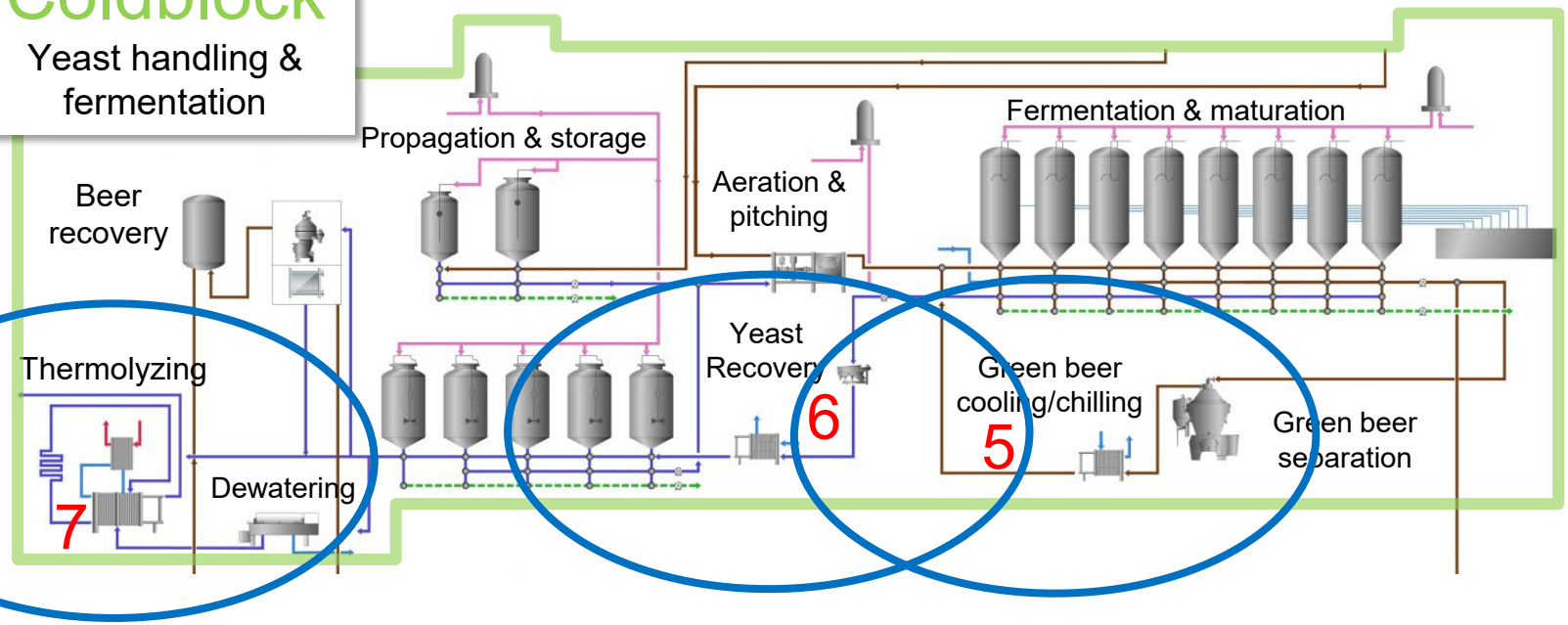
Unit No	Position
1	Wort pre-heater
2	External wort boiler
3	Vapor condenser
4	Wort cooler

Is this a brewery?

Coldblock

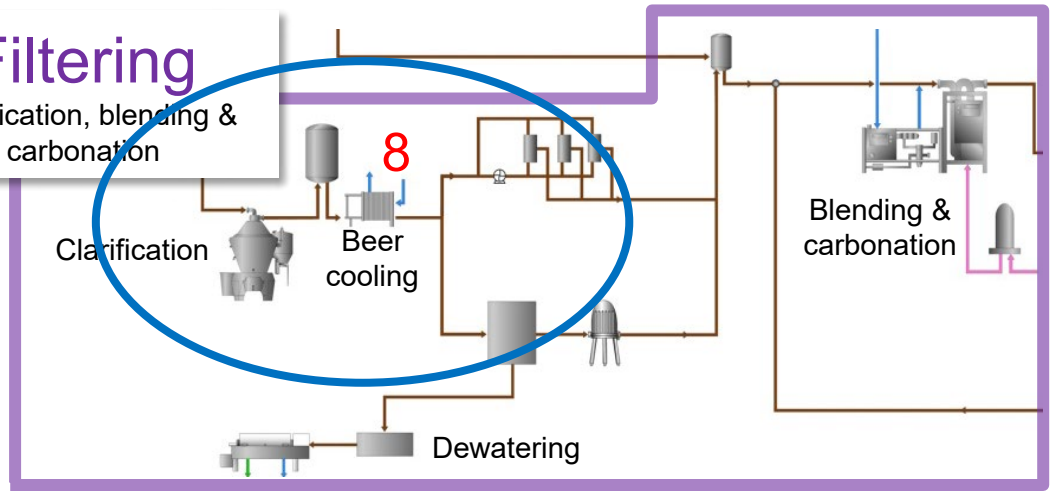
Yeast handling & fermentation

Unit No	Position
5	Green Beer cooler
6	Yeast cooling (Autolysing)
7	Thermolyzing

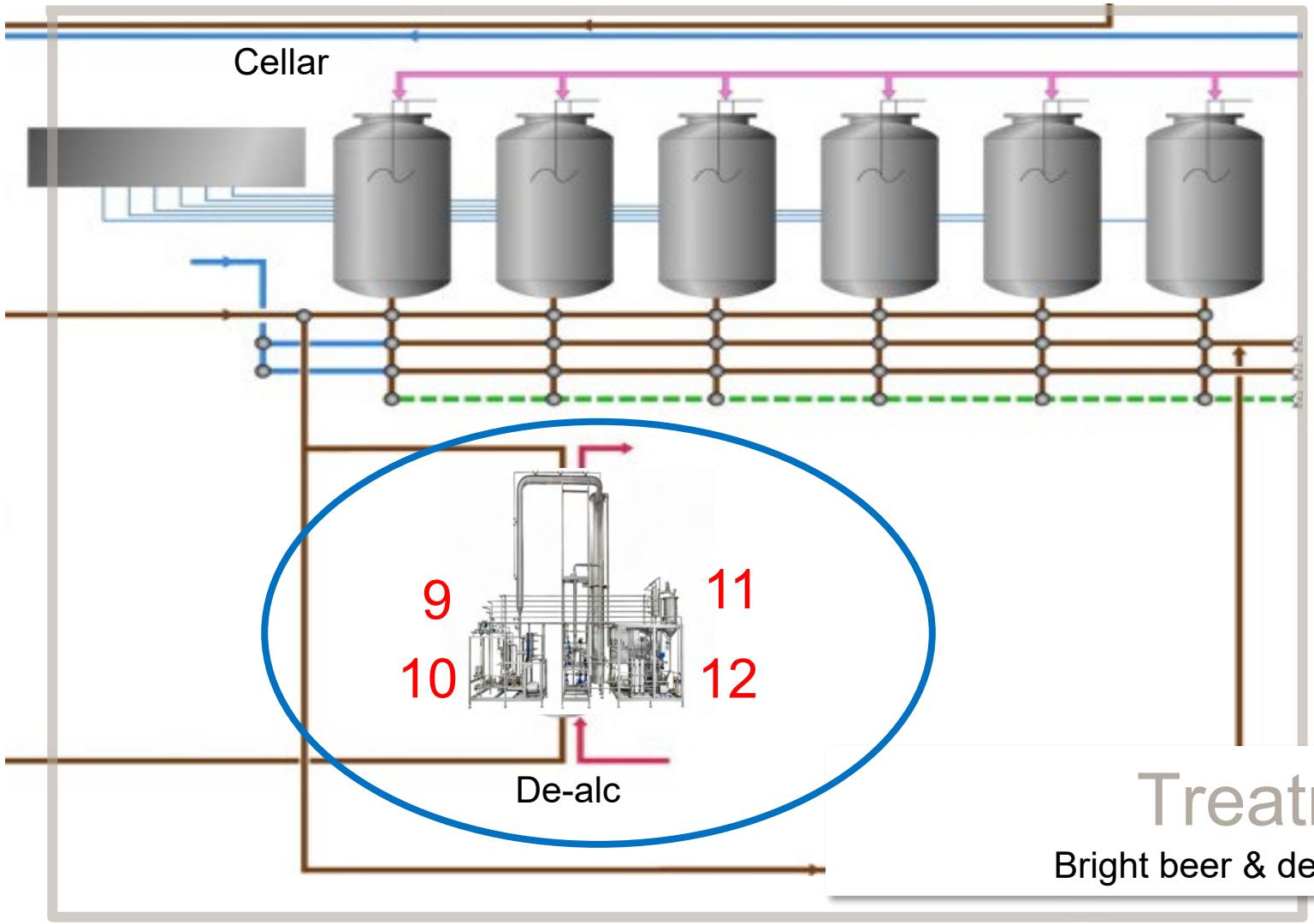


Filtering

Clarification, blending & carbonation



Unit No	Position
8	Beer cooler/chiller

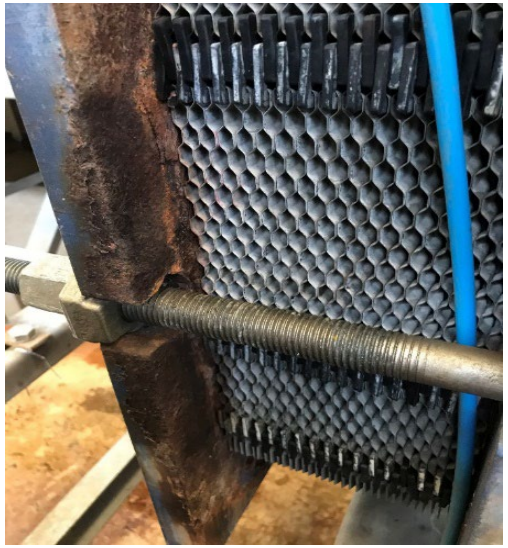


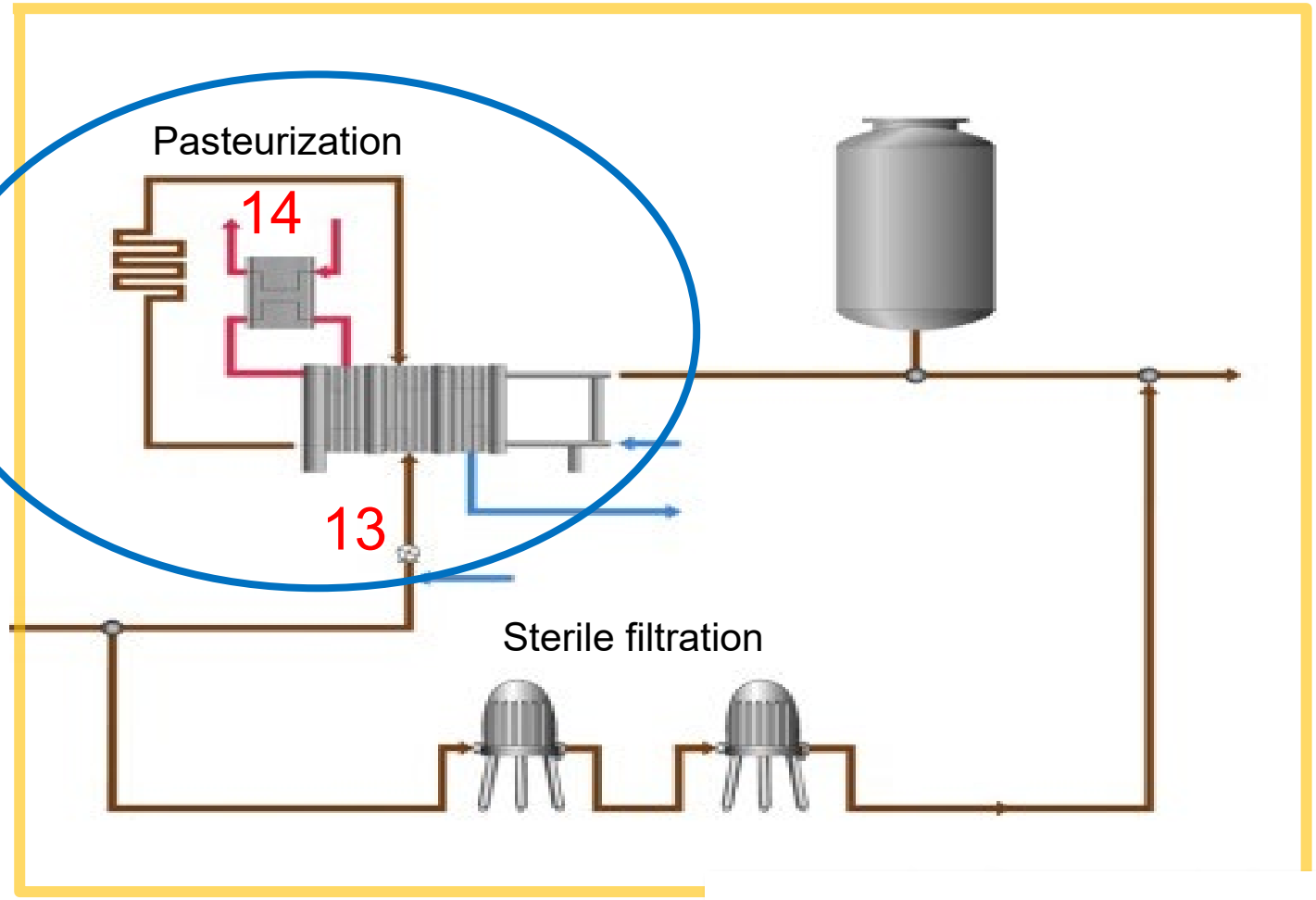
Unit No	Position
9	3-section unit
10	Steam generator
11	Condenser
12	Sub cooler

Treatment

Bright beer & de-alcoholization

Is this a brewery?



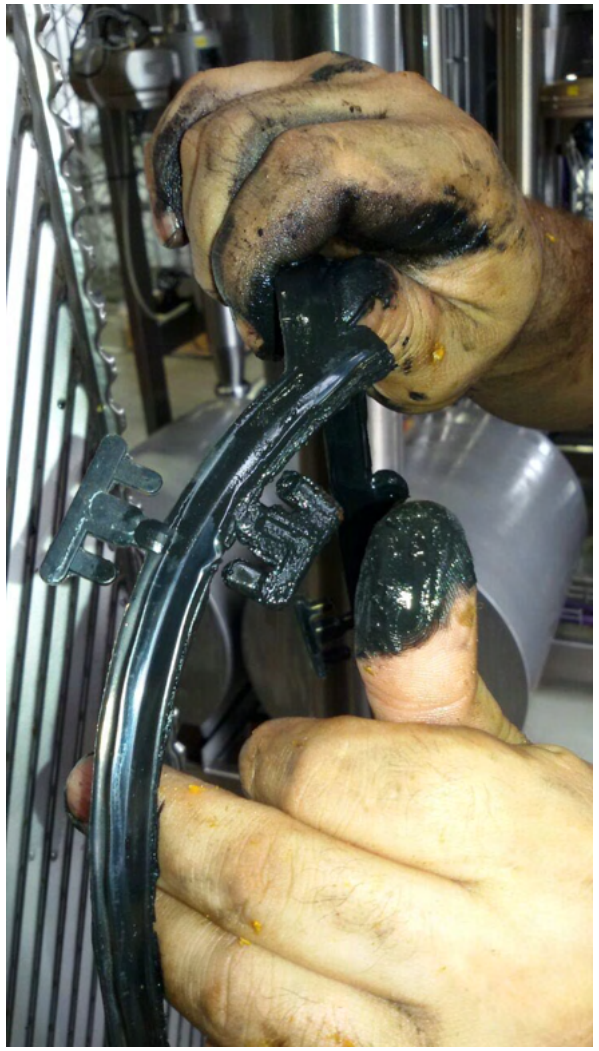


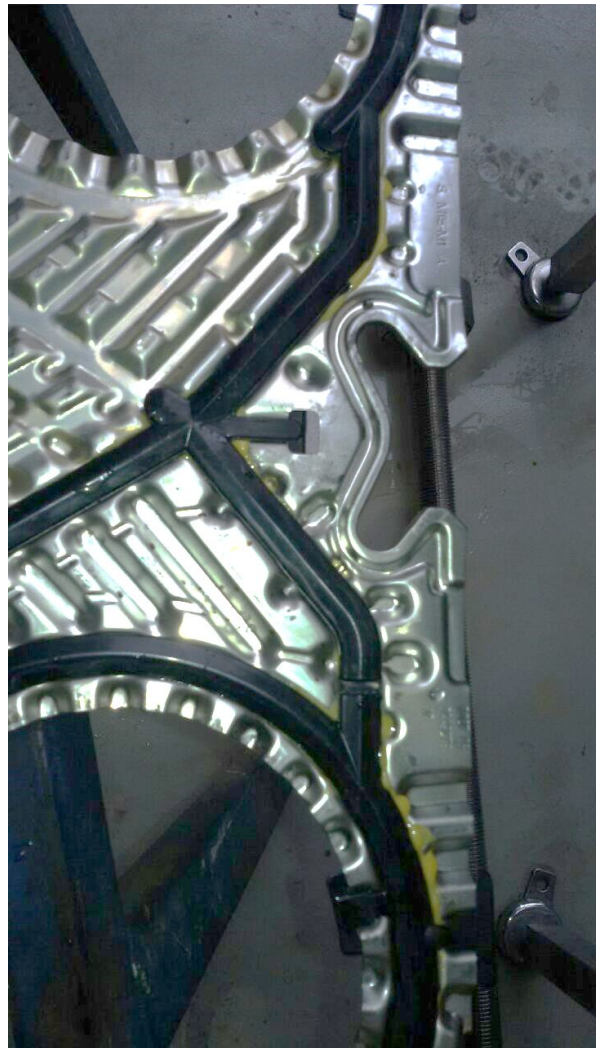
Unit No	Position
13	Flexitherm (beer flash pasteurization)
14	BHE (brazed unit) inside the Flexitherm module

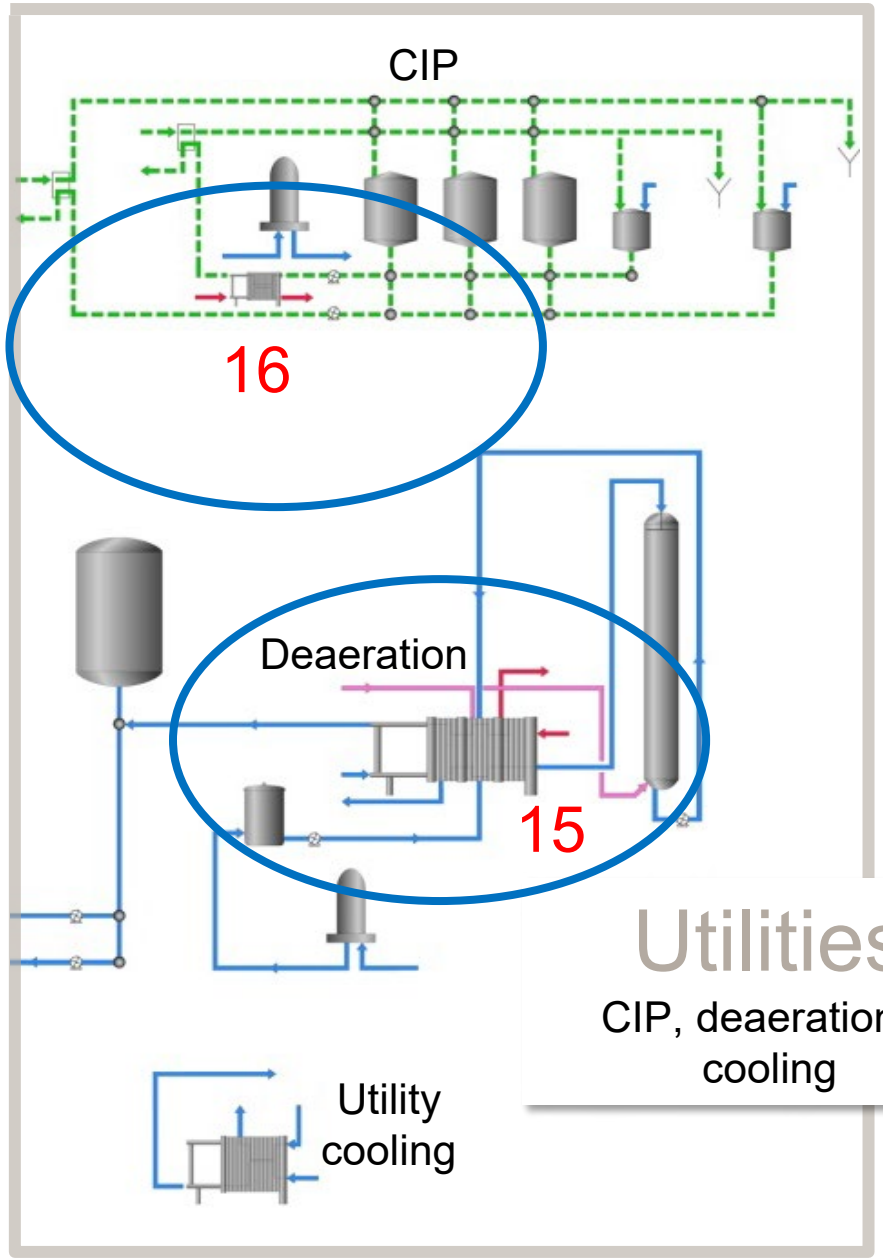
Packaging

Pasteurization, filtration & filling

Is this a brewery?







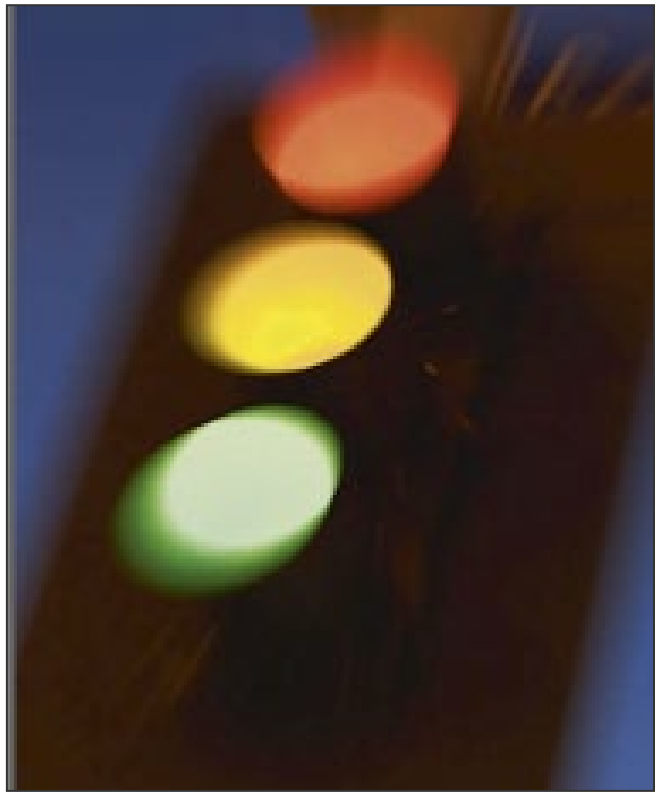
Utilities

CIP, deaeration & cooling

Unit No	Position
15	Aldox (water deaerator)
16	CIP heater

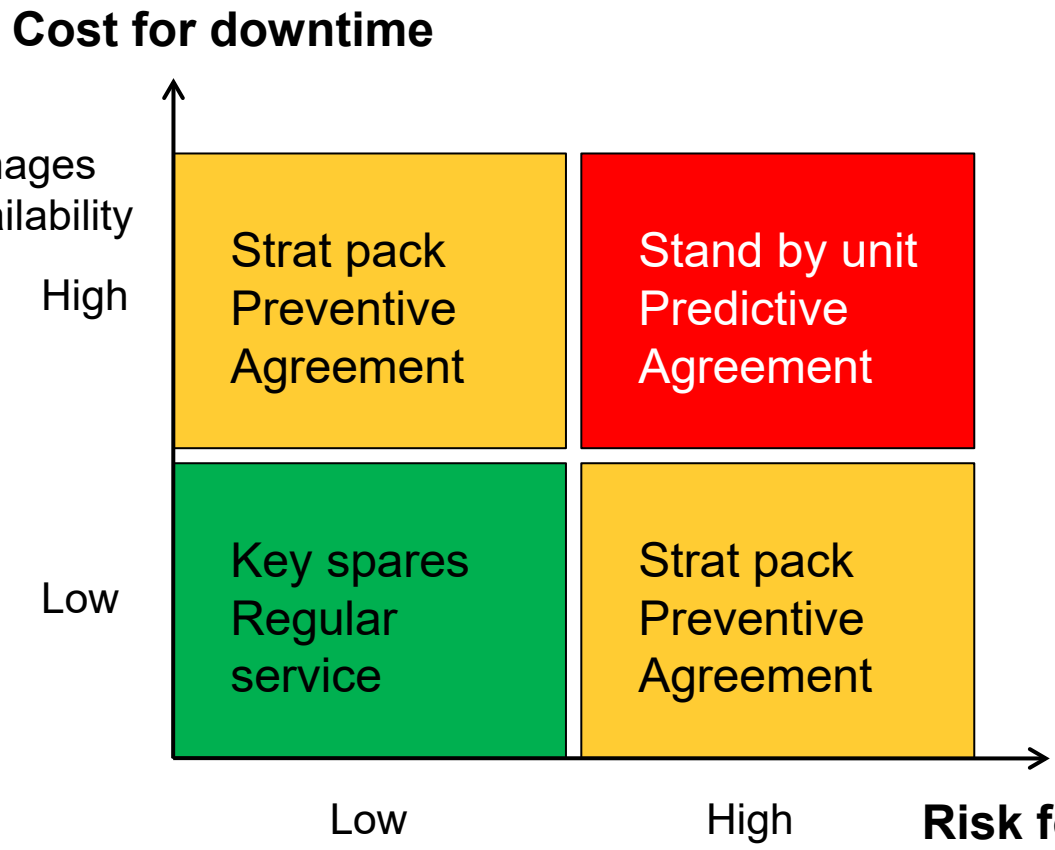
Maintenance strategy

Breakdown	• Fix when it breaks •Totally reactive
Preventative	• Planned service • Time / calendar based
Condition-based	• Monitoring condition and identifying failures
Predictive	•On-line monitoring, connected with sensors



Specific **maintenance plans** based on criticality and risk

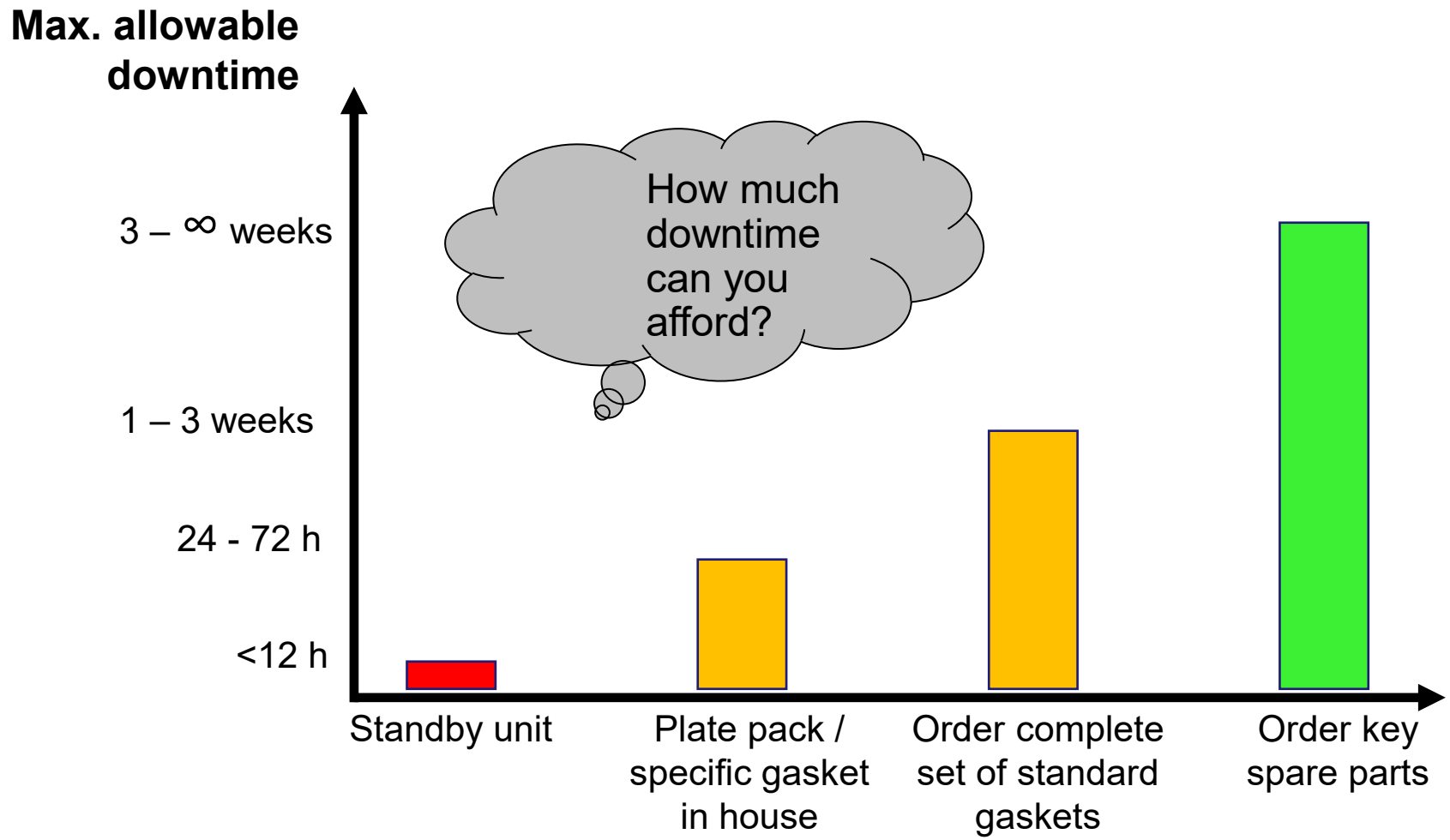
- Production loss
- Consequential damages
- Parts & service availability

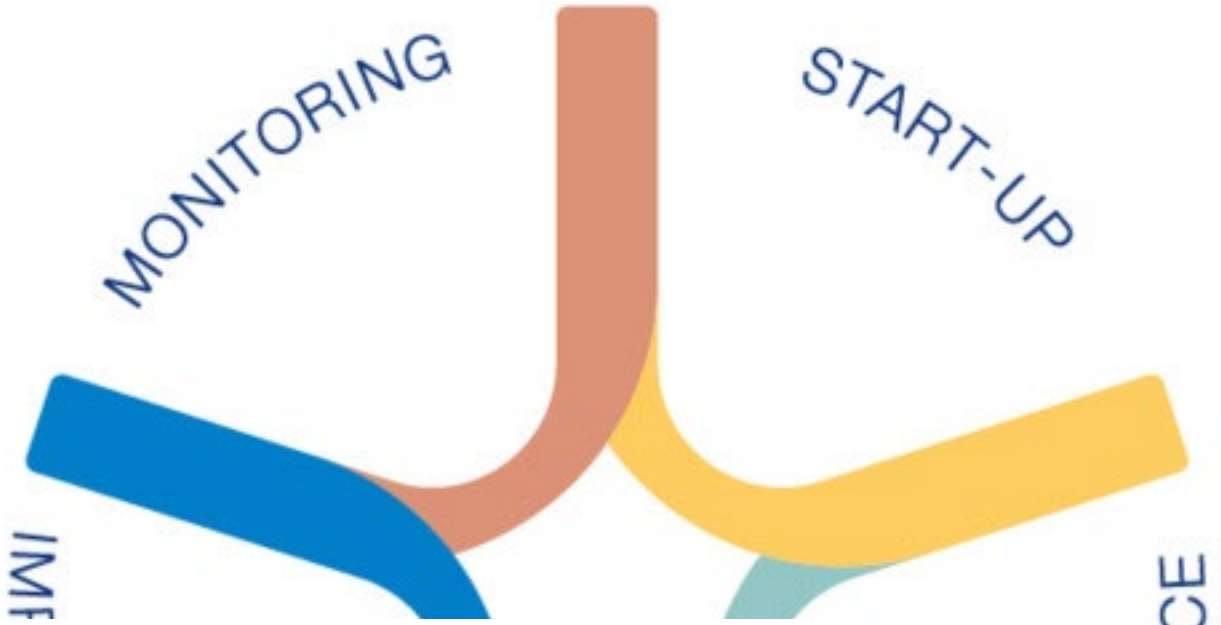


- High temp
- High pressure
- Corrosion
- Erosion
- Fatigue, cracks
- Fouling

Spare parts availability

Unit criticality





Maintenance when Heating & Cooling a process

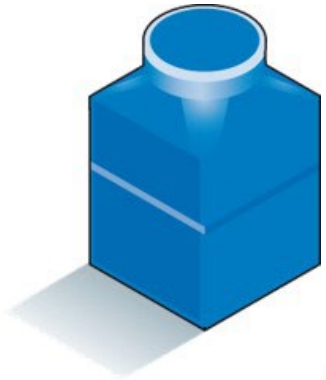
- Cooling a process
- How shall a heat exchanger be maintained ?
- Ammonia heat exchangers
- Can we recover the heat ?

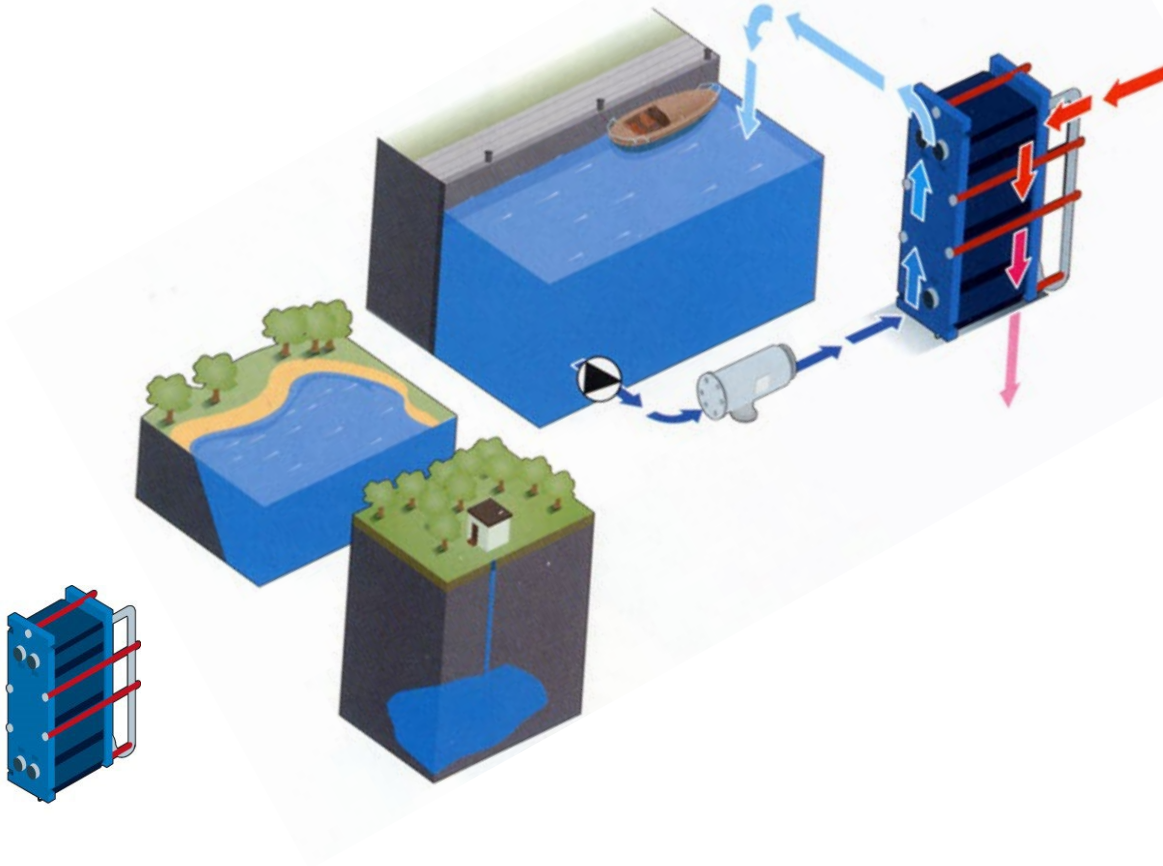
Ulf Grevillius

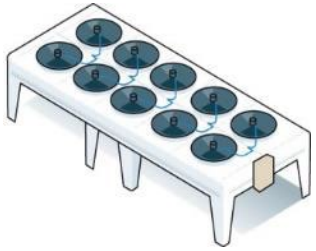
Cooling processes

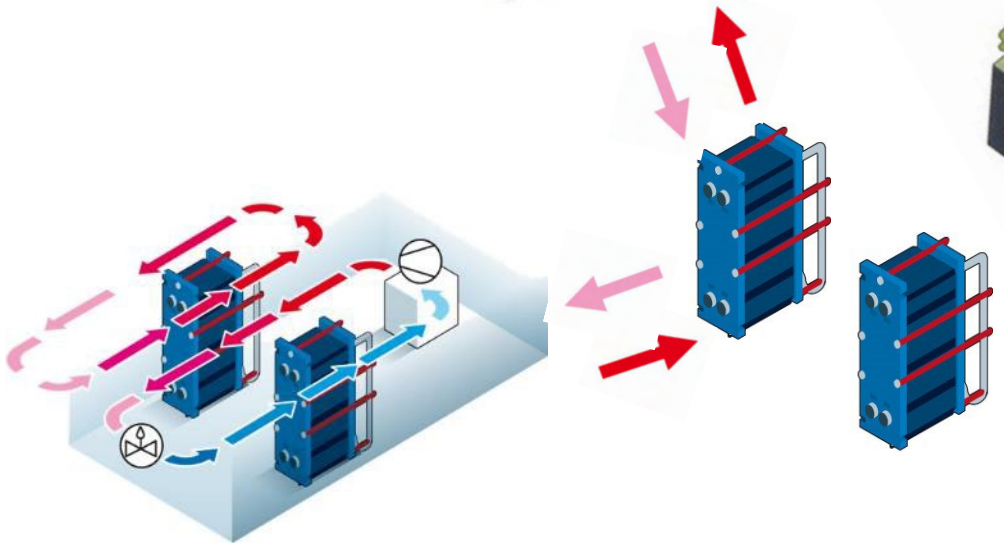
– Different cooling solutions

- Free cooling
- Cooling towers
- Chillers
- AIR heat exchangers





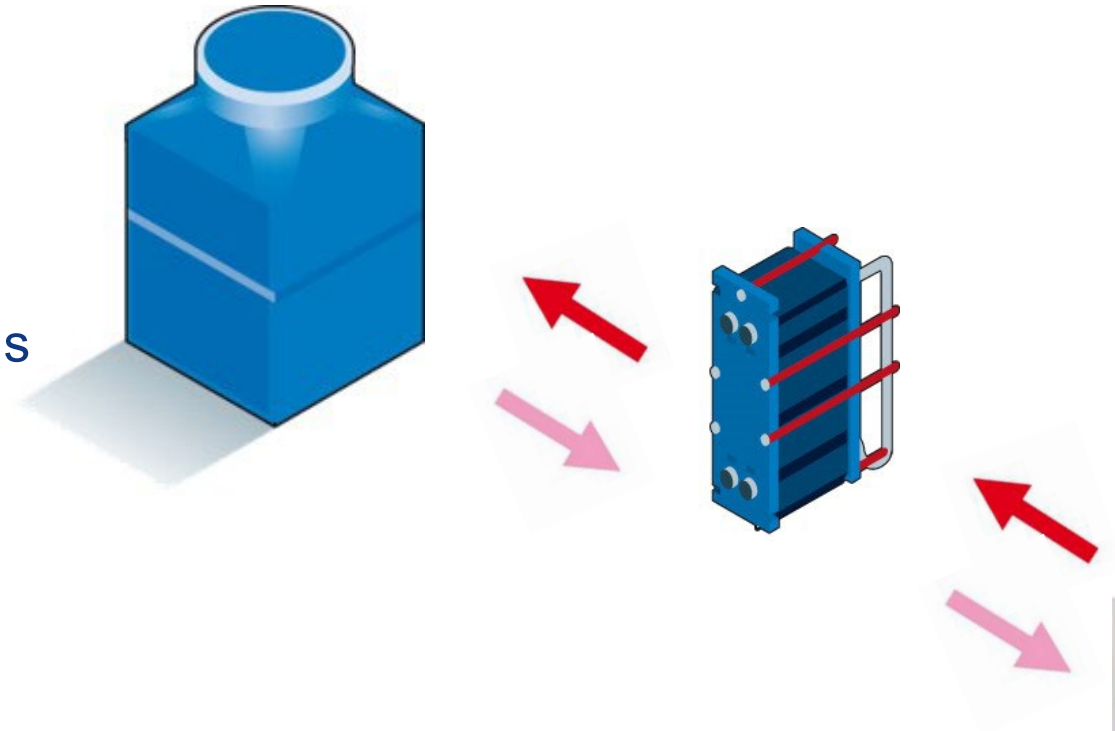




Any risk?

– Open to the ambient ?

- Biofouling
- Seaweed
- Barnacles, Sea shells
- Debris
- Sand
- Solids
- Dust

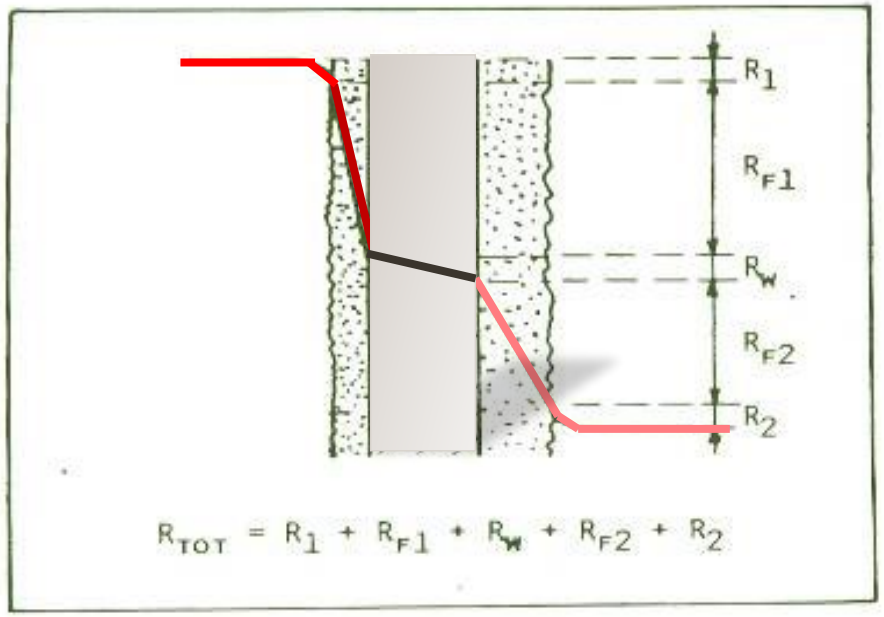


- Heat exchangers must be cleaned on regular basis
- Do not open though it reduces gasket lifetime.
- Cleaning In Place (CIP) – circulation of cleaning agents

Cooling processes

– What can decrease performance

- Deposits on plate – fouling
- Create resistance to transfer heat
- Create increased pressure drop

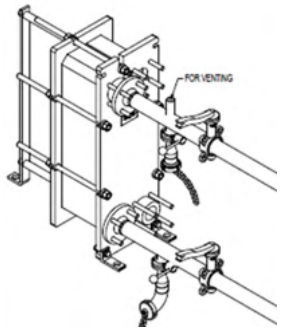


To deal with the debris and fouling

– Different solutions

Depending on the set up of the system around the utility heat exchangers and the cooling there are different solutions

- Filter the incoming with
  - ALF filter
  - Sarco Strainers
  - Backflushing valve



- Cleaning In Place (CIP)

- Redesign of the heat exchanger

Chillers

– How to maintain

Ammonia chiller systems

In these systems there is a compressor.

- Oil is present to make it seal and perform.

Oil is devastating for the Semi welded heat exchanger

- 15 µm oil film reduces performance by 30%
- The oil makes the ring gaskets swell and reduces lifetime

Monitor the temperature differences between in and out to understand when to maintain.

Maintenance: Service compressor, have oil traps, perform CIP

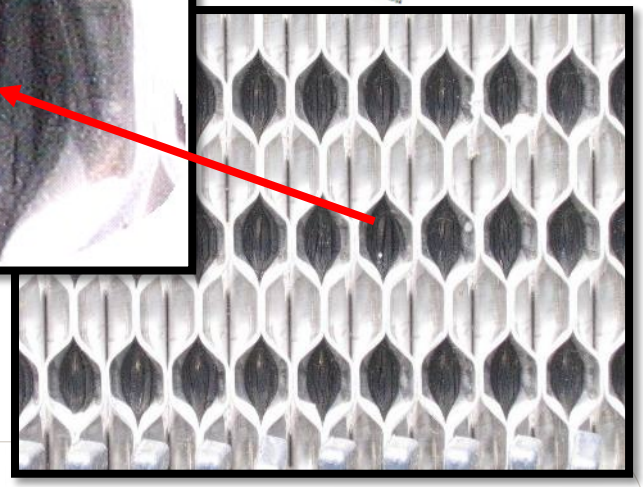
Heat exchangers

– General maintenance (1)

<u>Keep records of your maintenance and observations on Every heat exchanger!</u>

Control the A-measure

- Every tightening and locking bolt
- Verify towards drawing



Keep the tightening bolts clean and well lubricated with an extreme pressure grease.

- Every bolt, the hole bolt.
- Use bolt protections

Inspect the gaskets from the outside, look for UV- or ozon cracks

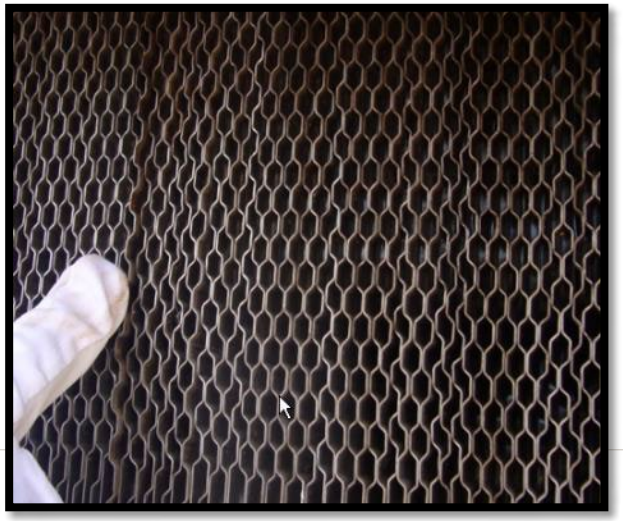
Heat exchangers

– General maintenance (2)

Look for external leakages

Spray from the side is often caused by Pressure surge

Look for plates shifted sideways
or snacking of the plate pack



Heat exchangers

– General maintenance (3)

Secure that all manometer & gauges (pressure and temperature) are working and calibrated.

Check wrong position of valve OR damaged pump on regular basis

Avoid splash of media containing chlorides, even stainless-steel can corrode.

The stainless-steel cladding (frame, pressure plate and connection plates) is satin polished. Clean with cloth wetted by paraffin oil. Yearly or when needed.

Opportunities

– Recover the heat

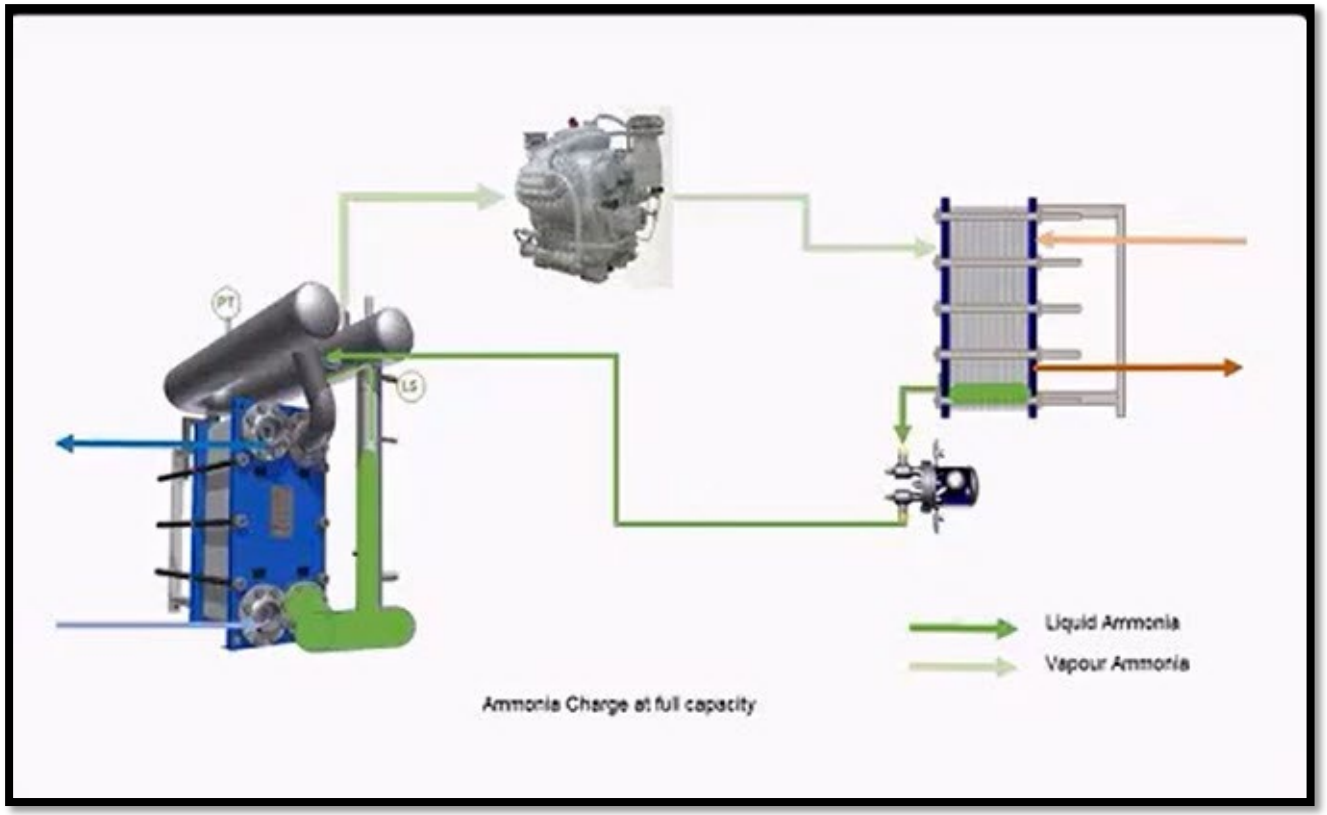
- Heat recovery from process waste heat
  - Low charge NH3 solutions for secondary systems incl U-turn option
  - Heat pumps

Heat to be used in:

- Other production processes
- Space heating
- Tap water

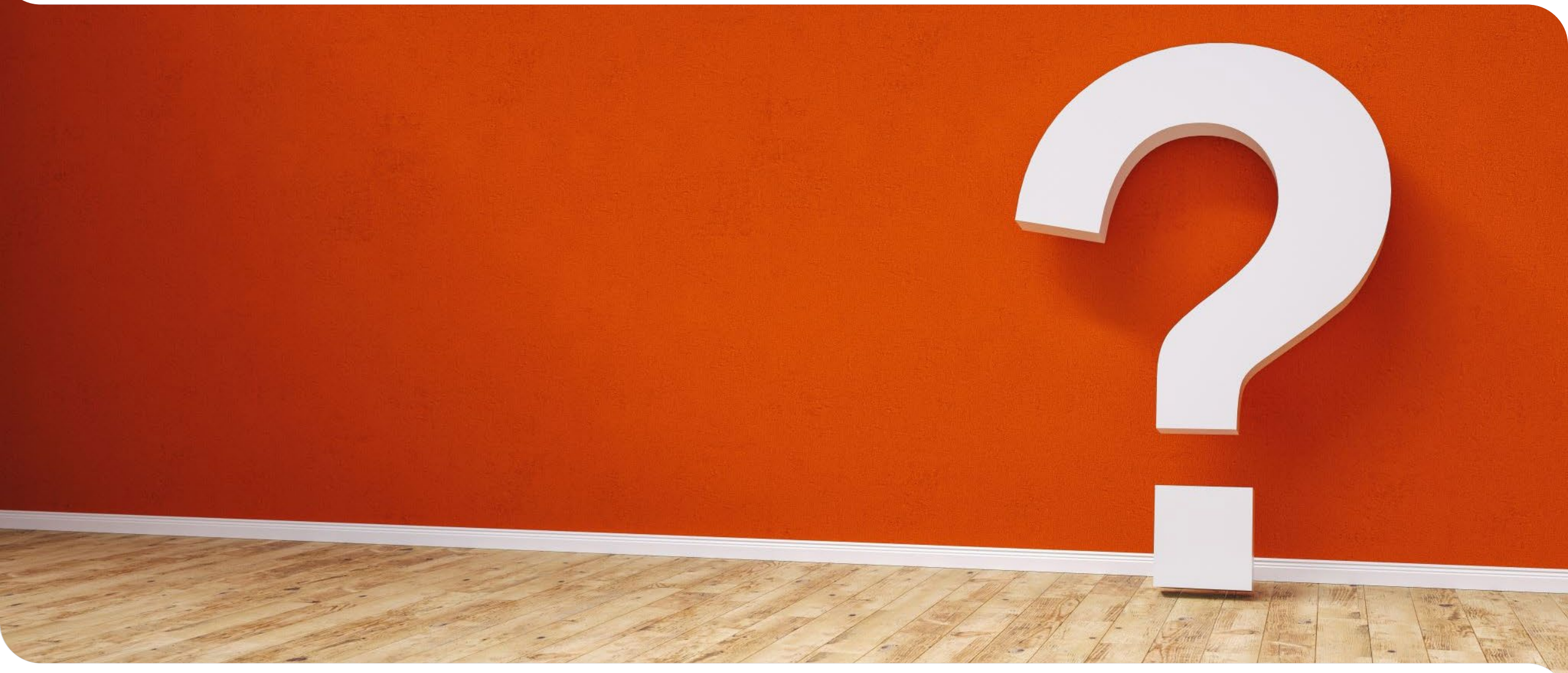
The U-turn refrigeration solution we at Alfa Laval can offer has compared to other technical solutions:

- 30% less equipment footprint
- 30% less refrigeration charge



End of Presentation

Q&A Session

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