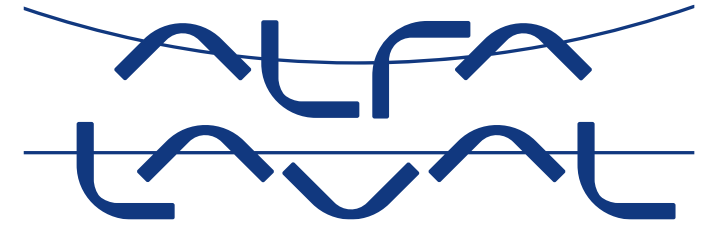


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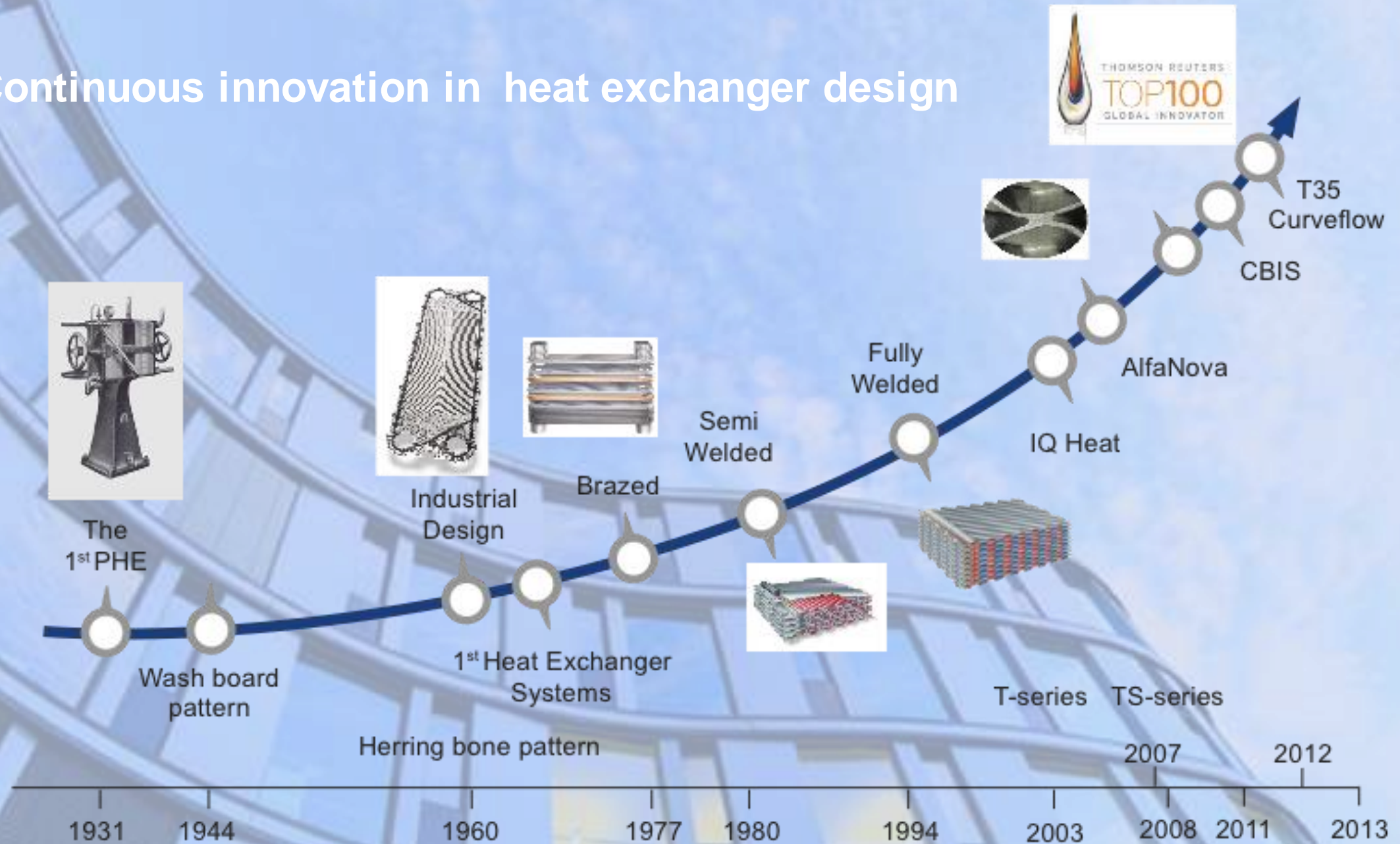


Tamer Nofal

# Smart HVAC service with cool savings

– Wednesday, March 29

# Continuous innovation in heat exchanger design

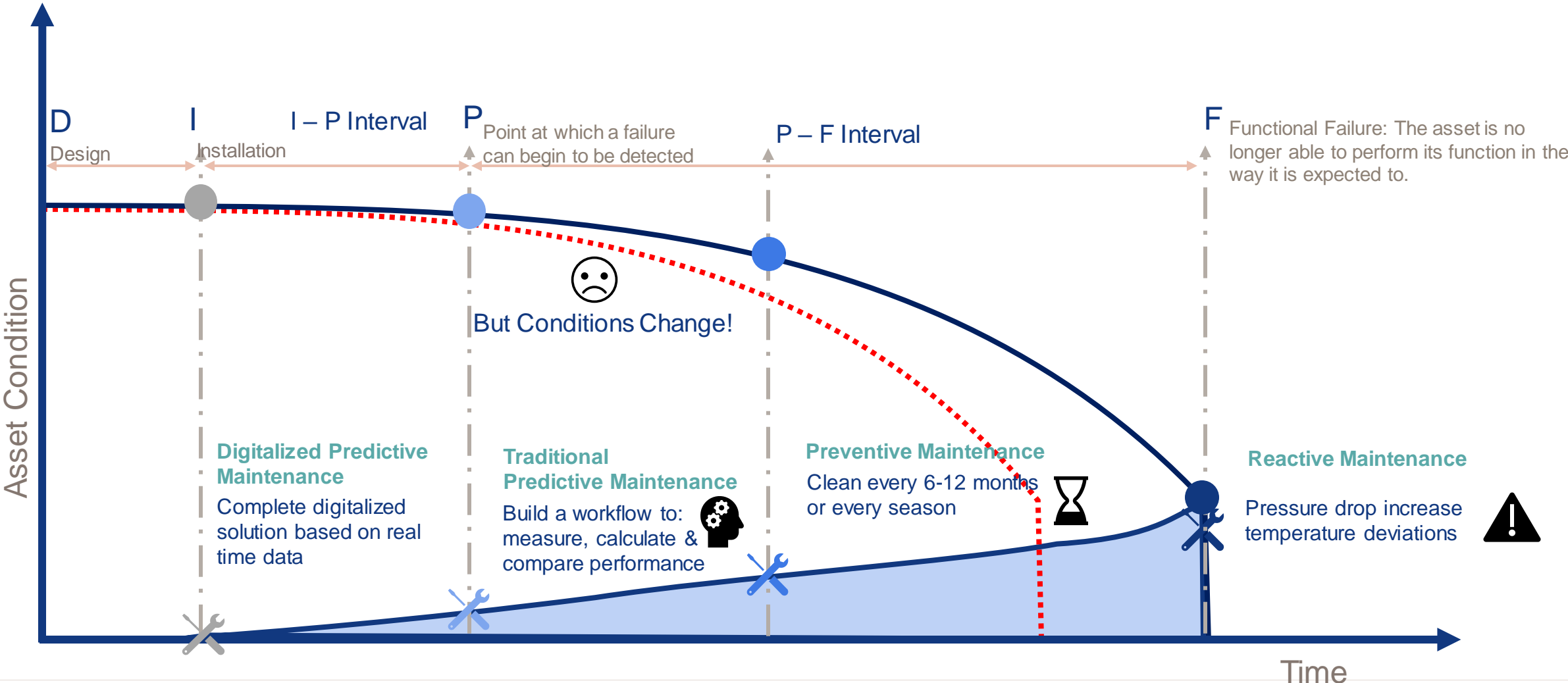


# Performance dilemma



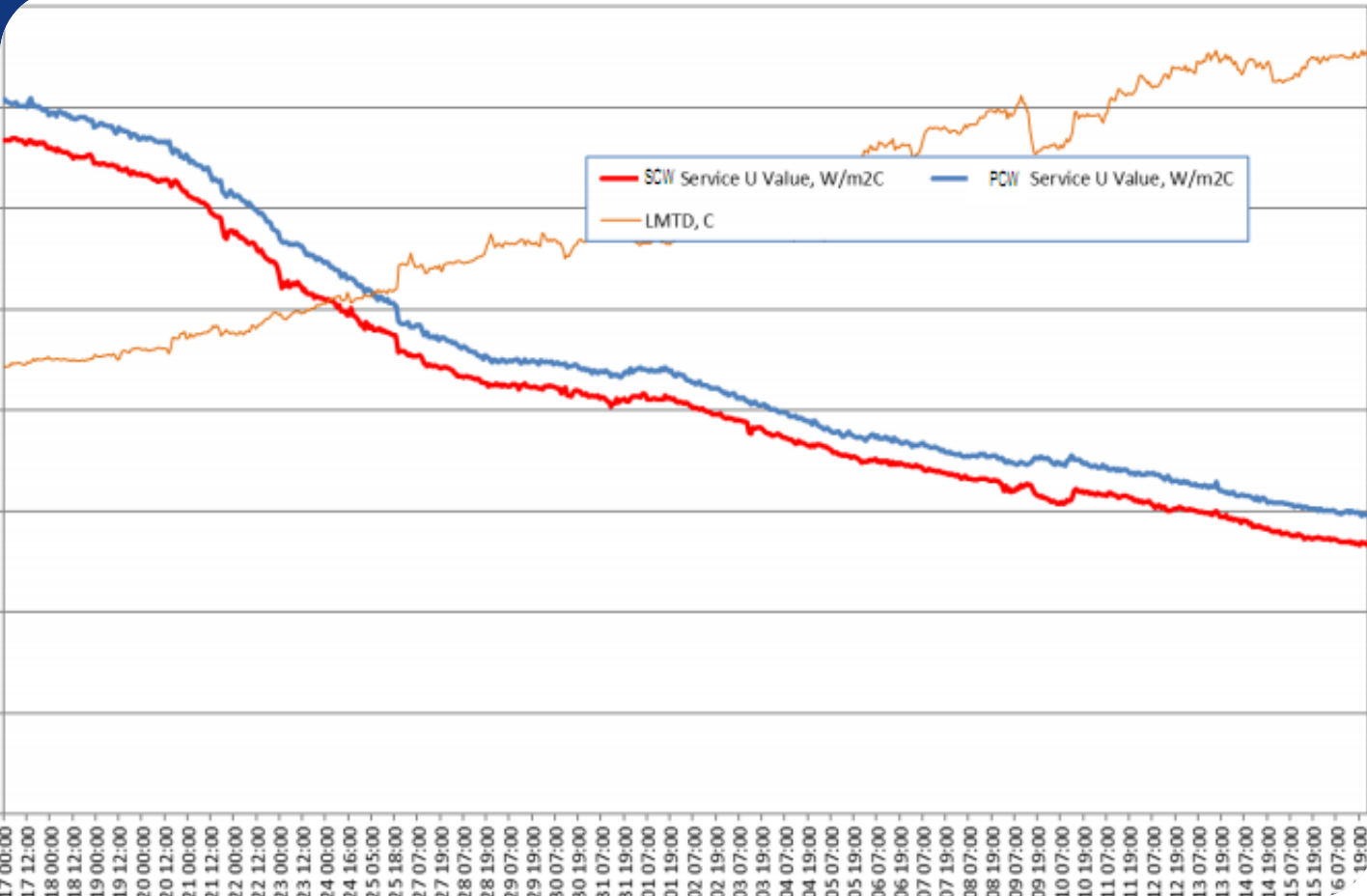
- When to clean?
- How to clean?
- Why clean?
- Which exchanger to clean?
- How reliable is my heat exchanger?
- How to avoid unplanned down time?
- What if an emergency happens?

# When to clean ?



# Fouling prediction

- A plug and play (PnP) solution doesn't work!



- Fouling resistance doesn't account for hydraulics
- Does not enable future performance prediction
- Can not be quantified to reflect economic impact from lost performance
- System specific (e.g. fluid, process conditions, surfaces)
- Indicators traditionally used in industry can be misleading
- Building measurements often missing and/or of not enough quality.

# Performance assessment

– Alfa Laval performance audit gasketed plate heat exchanger



## 1. Data collection and measurement

- Onsite measurement
- Logging of data
- Visual observations

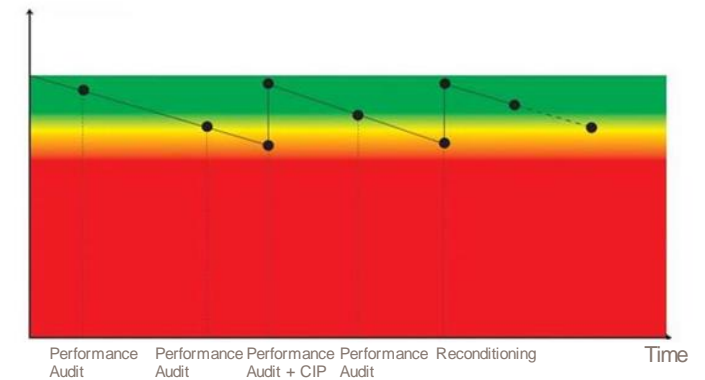
## 2. Analysis of collected data

- Data transfer to computer
- Evaluation of data
- Heat transfer analysis

## 3. Report creation and follow-up

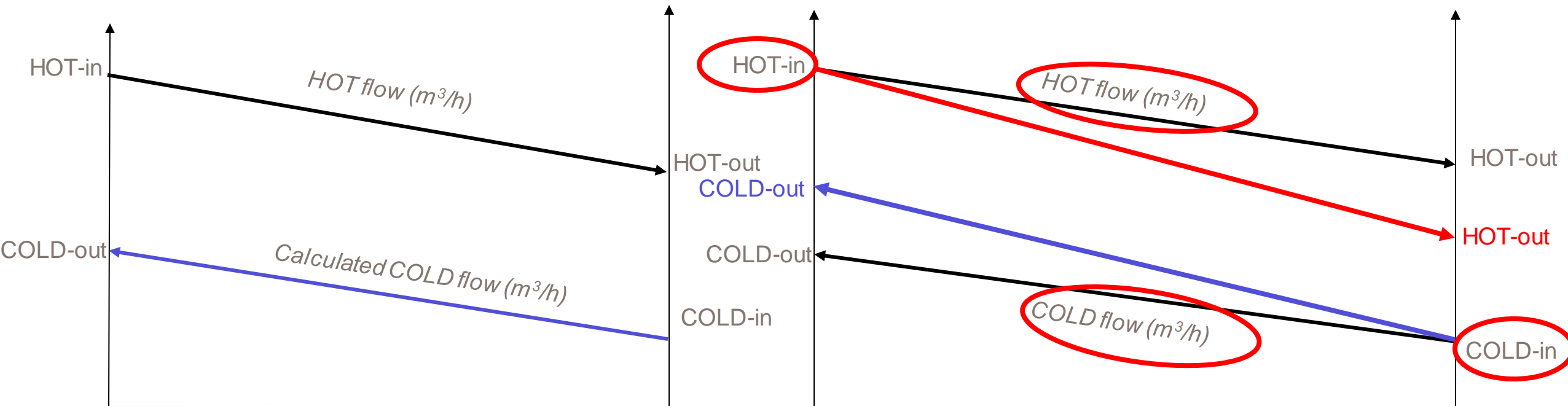
- Recommended actions
- Detailed performance status
- Follow-up

Heat transfer performance



Colour	Performance level	Action
Green	High	No action required
Yellow	Medium	Time to plan cleaning
Red	Low	Schedule cleaning as soon as possible

# How does it work?



$$Q_{\text{actual}} = m_{\text{hot}} \times C_{p_{\text{hot}}} \times (\Delta T_{\text{hot}}) = m_{\text{cold}} \times C_{p_{\text{cold}}} \times (\Delta t_{\text{cold}})$$

$$Q_{\text{optimal}} = k \times A \times \text{LMTD}$$

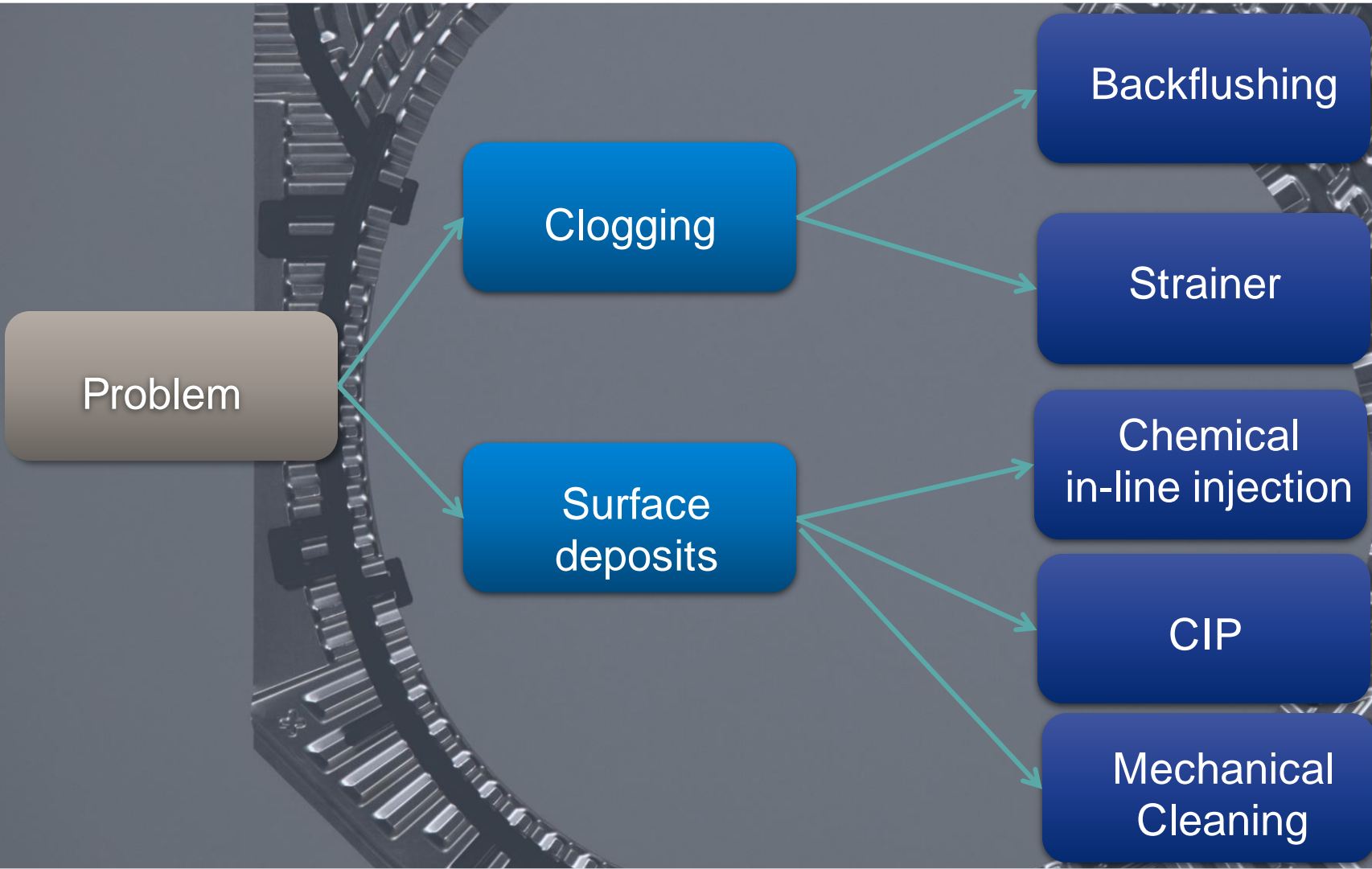
$$\text{Efficiency} = \frac{Q_{\text{actual}}}{Q_{\text{optimal}}}$$



# How to clean



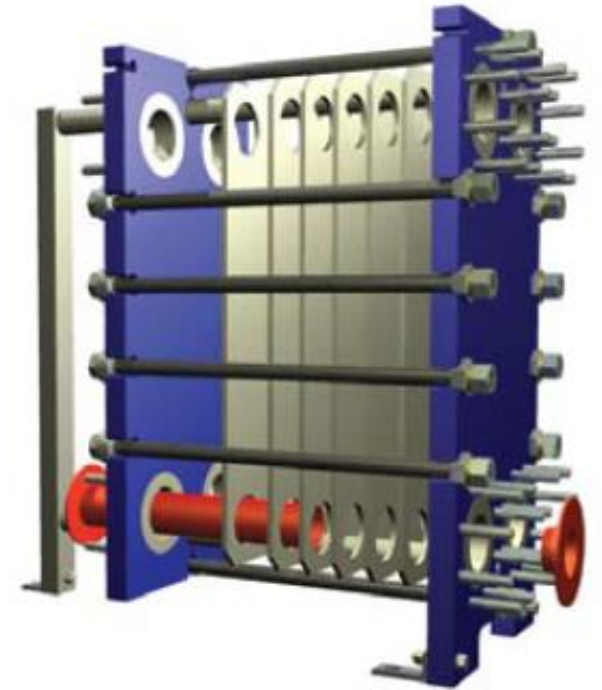
# How to clean?



# Alfa Laval port filter

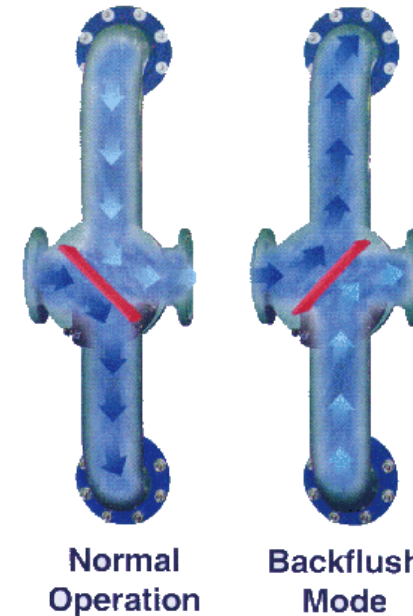


- Open loop cooling systems
- Traps debris in ports
- Inspection cover in pressure plate
- Manual cleaning of basket



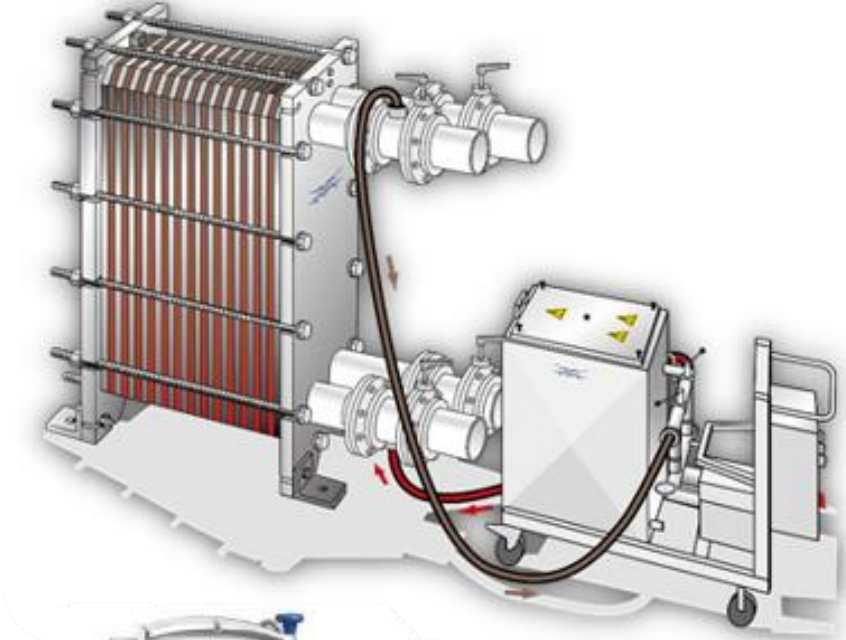
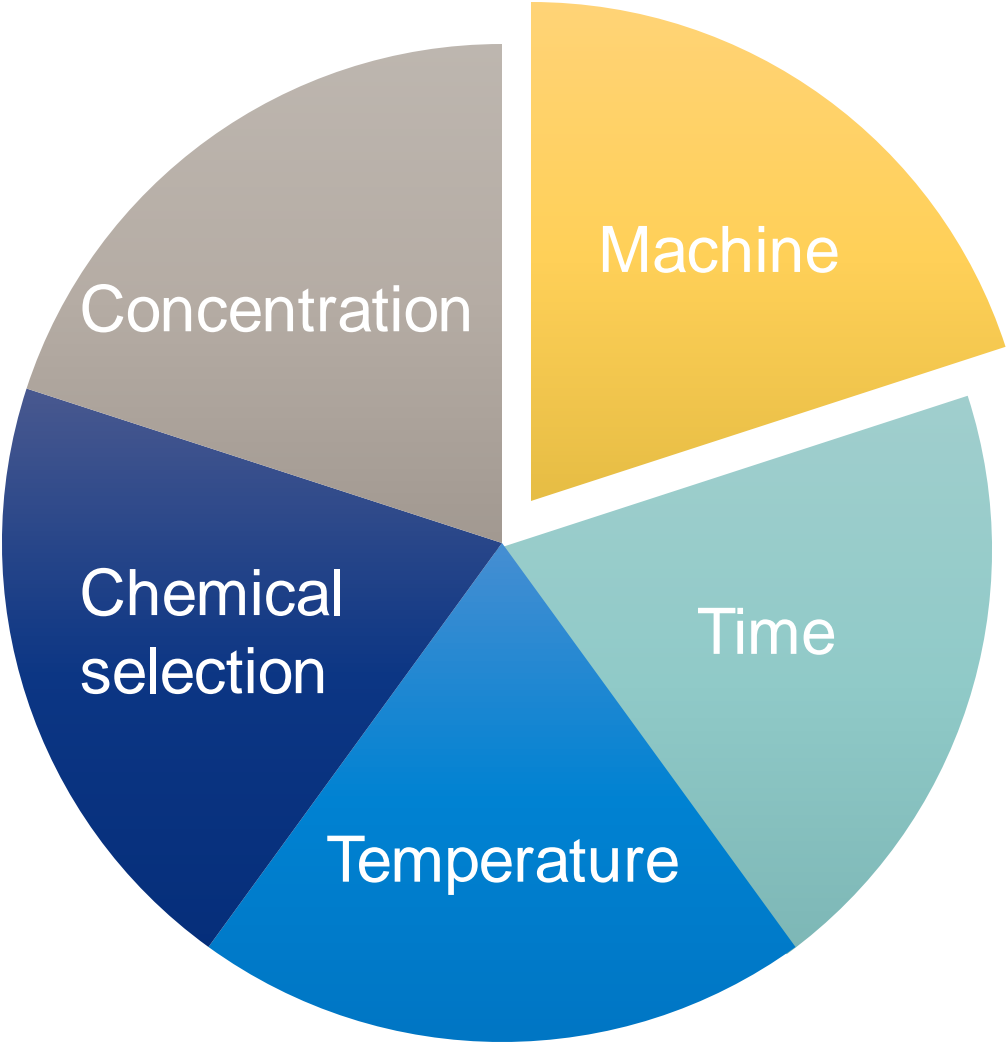
# Automatic backflush valve

- Open loop cooling systems
- Compact (mounted on PHE)
- **AUTOMATIC**
- Flush 3- 4 times daily for 30 seconds
- Removes blockage from ports
- Reduces fouling at contact points



# Cleaning in place

-CIP



# Reliable and efficient service practices



Pre-cleaning inspection



Gasket removal



Crack and deformity detection



Regasketing



Pre-cleaning inspection



Oven cured gasketing

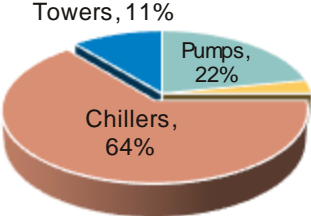
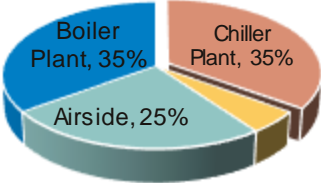
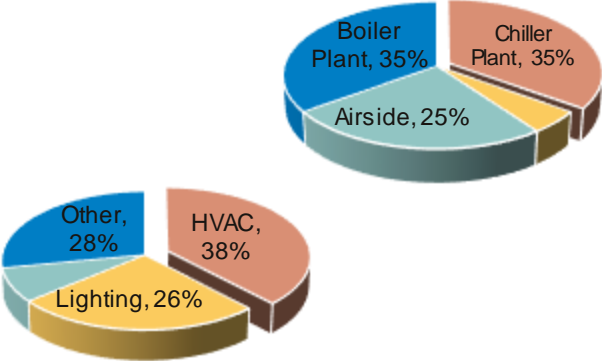
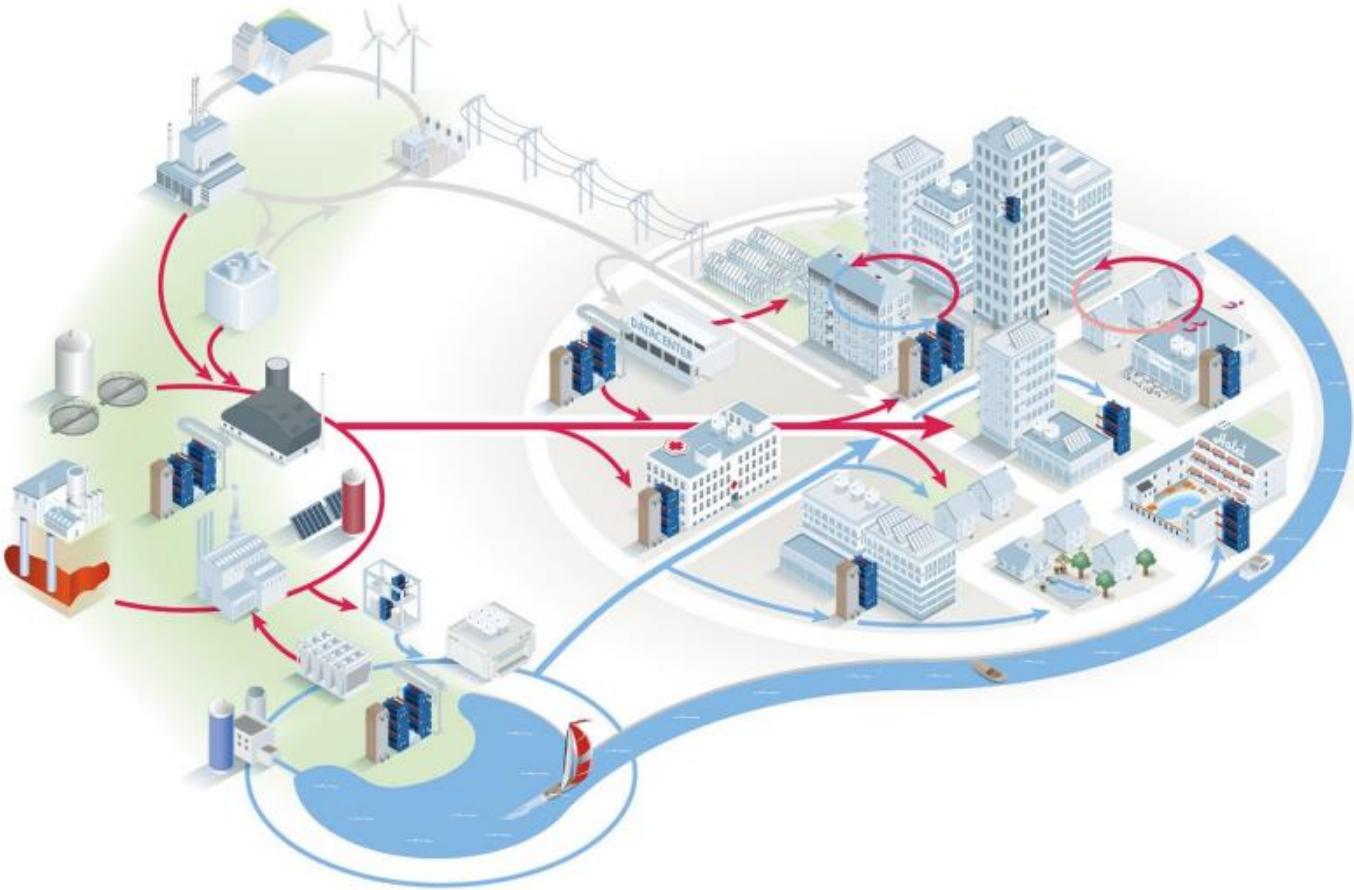


Hydroject cleaning

# Why clean?



# Heat transfer integration loops



Energy Generation



Energy Transmission



Energy Usage

$$\text{System Efficiency} = \frac{\text{Tons Output}}{\text{Total Input}}$$

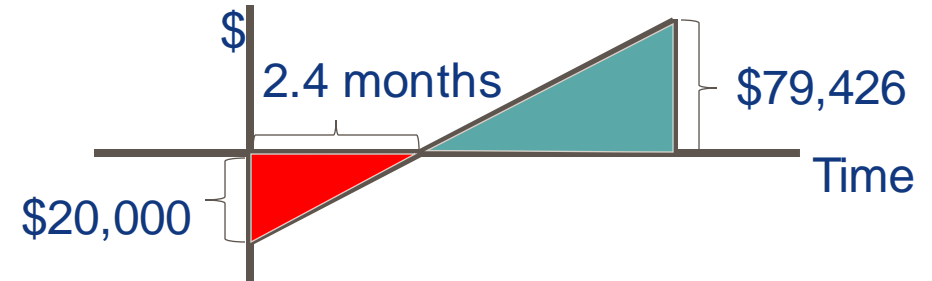


# Payback calculation

– Case story

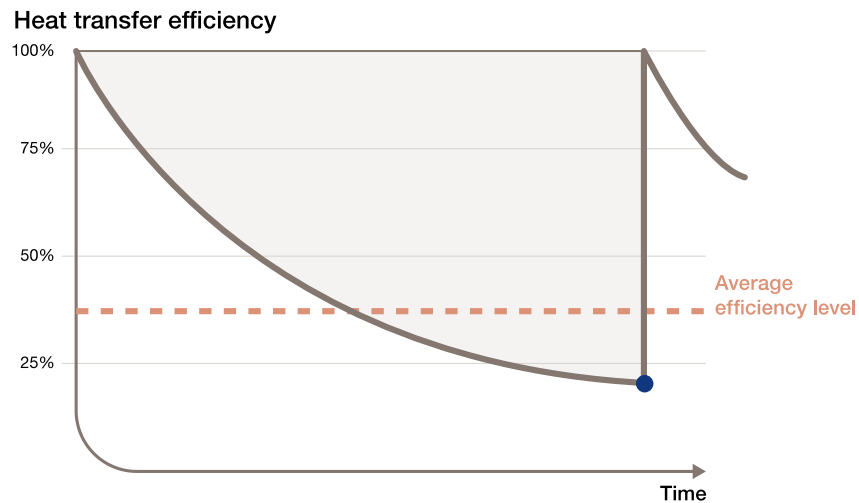


	Pre-cleaning	2,159 kW
	Post-cleaning	2,636 kW
	Energy recovered	477 kW
	Excess energy cost	\$99,426
	Service cost	\$20,000
	Emissions savings	117 ton/yr



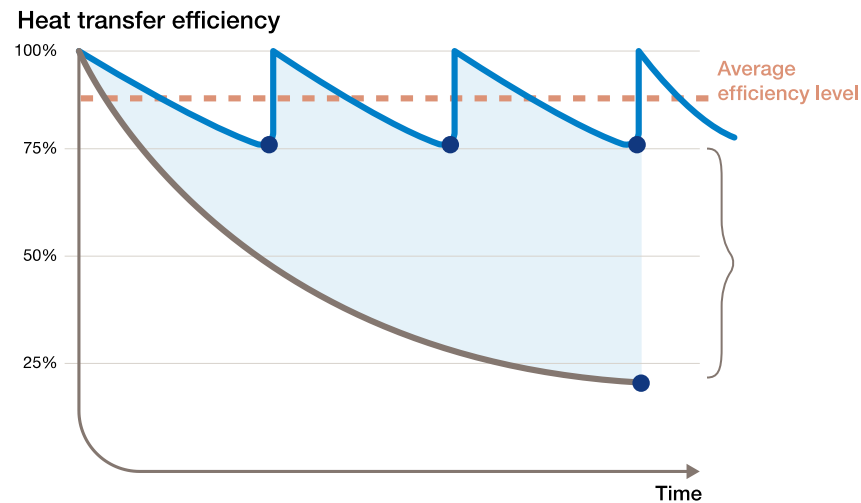
# The value of service

## Traditional performance of plate heat exchangers



Due to fouling build up, heat transfer capacity and equipment performance reduces over time. This results in increased energy consumption, carbon emitted and operation expenses

## Optimal performance of plate heat exchangers



With regular maintenance you can reduce the impact of fouling, increasing energy efficiency, lowering energy consumption, emitting less carbon and optimizing life-cycle cost



Energy savings

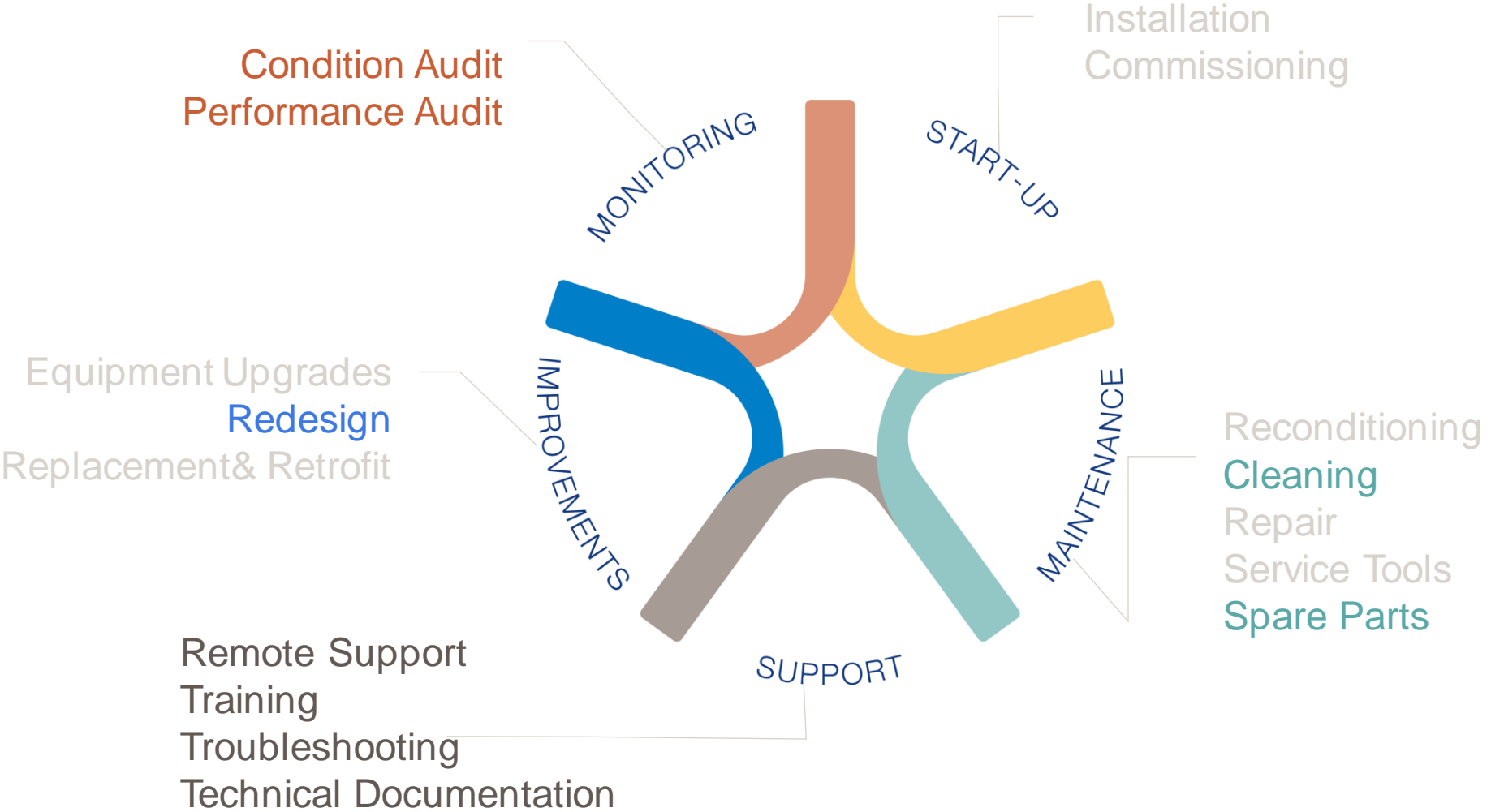


Cost savings



Emission reduction

# 360° Service portfolio



# Service agreement

– Scope of services



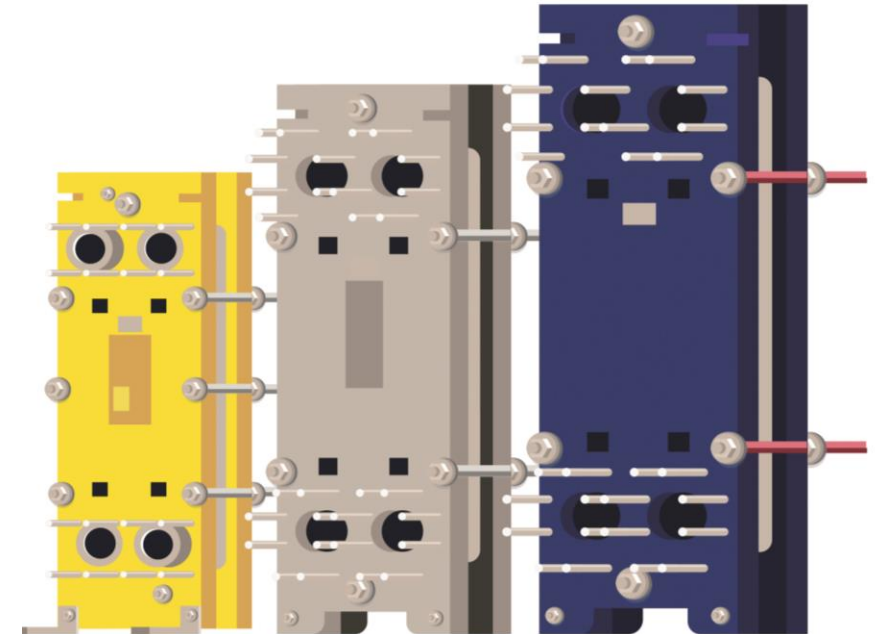
- Service level I
  - Reconditioning/cleaning all critical exchangers
- Service level II
  - Reconditioning/cleaning of all installed exchangers
- Condition audit
- Performance audit
- Gaskets upgrade
- Strategic spare parts stocked locally
- Crew training
- MyAL access to documentation
- Remote support



# Heat transfer service across brands



- Alfa Laval can service any plate heat exchanger, regardless of the brand or model.
- We can even supply compatible gaskets for heat exchanger models from other brands. These gaskets comply with the quality standards of Alfa Laval.
- Alfa Laval supplies compatible gaskets. Many are stocked; some are made to order.
- If required, Alfa Laval can supply the compatible plates for many models as well.



# Q&A

For more information, please visit  
<https://www.alfalaval.us/service>



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