



Technical paper



# In pursuit of long-term energy savings

Discovering lower total cost of ownership  
with more efficient heat exchangers

December 2018



## Contents

|                                              |    |
|----------------------------------------------|----|
| 1. Introduction .....                        | 3  |
| 2. New possibilities for profitability ..... | 5  |
| 3. Understanding the latest innovations..... | 8  |
| 4. Conclusion.....                           | 11 |



# 1. Introduction

The global demand for energy shows no signs of slowing down. In the years to come, it will be increasingly tough to stay competitive, as businesses in every market and every industry seek new ways to maximize yield while simultaneously keeping down power costs and boosting their environmental profile. The challenges will be complex and multifaceted.

To meet these challenges, a range of sustainability solutions have emerged. Today, those focused on improving energy efficiency stand out as a smart approach for supporting economic and population growth with a minimized environmental impact. But that is just the beginning. For businesses that go about it in the right way, increased energy efficiency can also represent pure profit.

In the pursuit of energy savings, few pieces of equipment can play as important a role as your heat exchanger. Installing high-efficiency heat exchanger technology creates new opportunities for shrinking your energy bill and CO<sub>2</sub> footprint, without compromising product output or quality. In many cases, the return on investment can be less than a year.



The gasketed plate-and-frame heat exchanger, a tool used in countless industrial applications, has undergone significant advancements in recent years. While their overall appearance has changed little for decades, the core of today's gasketed plate heat exchangers contain several innovations that allow for improved thermal performance. The result is a modern solution for improving energy efficiency in nearly any type of production.

This article serves as a brief introduction to the steps that have been taken to improve the efficiency of gasketed plate heat exchangers. The following section provides an overview of the different ways that newer heat exchangers can contribute to overall energy savings in industrial heating and cooling applications. The paper then takes a closer look at the technology itself to understand what makes today's heat exchangers more efficient than their predecessors.

Whether you are considering equipment for a new installation, looking to upgrade your existing heat exchangers or exploring the possibilities of expanding your capacity, we hope the information contained here will help you when evaluating different technology.



## 2. New possibilities for profitability

Despite all of today's challenges, "change" is still a scary word in many industries. Switching to new technology can seem like a risky and potentially costly proposition for some businesses. For these reasons, it is useful to take a closer examination at the various ways that more efficient heat exchanger designs help companies secure greater short and long-term value in their operations.

In addition to minimizing your environmental footprint, today's gasketed plate heat exchangers contribute to more profitable production by lowering operational and capital costs as well as increasing yield. Often the savings are so substantial that the equipment payback time can be measured in a matter of months.

The following are five key ways that improvements in gasketed plate heat exchangers can create new possibilities for profitability in industrial heating and cooling applications:

### Energy recovery

In almost all industrial businesses, power costs represent a substantial part of the operating budget. An easy way to cut energy consumption is to recover energy for reuse in your processes. While many businesses are already doing this, the results are often limited by the efficiency of their technology.

Compared to earlier generations, newer gasketed plate heat exchanger designs can provide improved media flow and greater use of the heat transfer surface. This allows you to use more energy that would otherwise have gone to waste, reducing fuel consumption as well as related emissions costs.

In some cases, improving a facility's energy efficiency can even lead to a surplus of heat. That means that in addition to cutting costs, modern heat exchangers can help further boost profitability by allowing excess heat to be sold, for example, as steam to neighbouring plants or for use in district heating systems.







## Lower heating and cooling costs

Growing advancements in plate pressing and design have made it possible for today's plate heat exchangers to operate with a closer temperature approach than ever before. In fact, the temperature difference,  $\Delta T$ , can be as low as 2°C (3.6°F).

In other words, the cold medium in heating applications can be heated to a temperature very close to that of the entering hot medium. And vice-versa in cooling applications.

This makes it possible to operate with a utility medium that has a starting temperature close to that of the process medium. Less energy is needed to heat or cool the utility liquid before it enters the heat exchanger, further reducing overall operating expenses.

## Reduced capital investment

By improving the flow of media across the plate and better utilizing the heat transfer surface, you can produce a gasketed plate heat exchanger that uses dramatically fewer plates. Newer designs can therefore be both smaller, lighter and more environmentally friendly, since their construction requires less raw material.

A more compact heat exchanger design can cut installation costs considerably when either replacing older technology or expanding plant capacity. For facilities where space is a critical factor, it is also easier to install the heat exchanger within a limited existing footprint.

## Minimized downtime

Fouling-related downtime is not only a productivity issue. It also impacts efficiency. As fouling builds up, thermal performance decreases and pressure drop increases, requiring higher energy consumption. Pumping fluid through a fouled heat exchanger also requires more power.

New plate innovations designed with these challenges in mind can help to reduce the risk of fouling in the first place. Additionally, improved frame designs make it easier and faster to open and close the unit, meaning it is simpler to clean the plates with the shortest possible interruption in production.

## Increased capacity

Installing more efficient heat exchangers is often the best way to resolve bottlenecks caused by insufficient heating or cooling capacity. Better thermal transfer means more energy goes into the process, making it possible to increase your available capacities while decreasing your costs.

Additionally, as noted above, today's more compact designs can also resolve challenging space issues. They thus offer much higher cooling or heating capacity per square meter, leading to increased potential yield within an existing floor space.



### 3. Understanding the latest innovations

Rather than any single advancement, today's heat exchangers are the product of a long series of developments. In recent years, engineers have managed to improve specific aspects of thermal performance through changes in the design of the heat exchanger plate, as well as the frame and the gasket. Taken together, these innovations have allowed for a substantial increase in the overall efficiency of the unit.

Understanding the many ways heat exchanger efficiency has improved can be useful when evaluating new technology and comparing suppliers. The following is a list of newer design features to consider during your selection process. The importance of each feature may vary, depending on the relevant industry and the specific duty in which the heat exchanger is used.



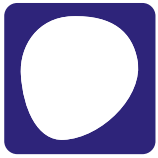
CurveFlow™

#### Optimized distribution area

By optimizing the media distribution area in the plate pattern according to the unit's target application, it's possible to use more of the plate and thereby get the most from the available heat transfer area. The right distribution design can also improve the flow of media across the plate, eliminating dead spots and reducing the risk of fouling for even higher thermal efficiency. This further provides the added benefit of longer intervals between cleaning, for increased productivity and profitability. A contemporary example of this feature can be found in the plates of Alfa Laval's gasketed heat exchangers, which incorporate a patented distribution pattern known as CurveFlow™.



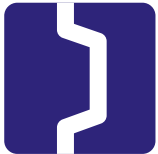




OmegaPort™

## Modified inlets and outlets

Heat exchanger inlets and outlets have traditionally been circular, but recent developments in the technology suggest that this shape does not always provide the ideal flow of media across the plate. Designs like the Alfa Laval OmegaPort™ noncircular port holes enhance flow, allowing for decreased pressure drop and increased throughput, along with further improved utilization of the plate surface.



Offset gasket groove

## Offset gasket groove

In traditional gasketed designs, the groove holding the gasket in place has typically limited the amount of available heat transfer surface and, as a result, the unit's thermal efficiency. In newer units, engineers have therefore sought to open up as much space as possible for heat transfer. Alfa Laval's heat exchanger plates with a gasket groove in a zig-zag pattern is an example of one such feature that has made this possible.



FlexFlow™

## Asymmetric channel design

In a heat exchanger with a traditional symmetrical plate configuration, the channel for the utility medium matches the one used for the process liquid. It should come as little surprise that this has long resulted in a number of inefficiencies, such as increased pressure drop. After all, the different media often have different flow rates, possess different characteristics and behave in different ways.

A plate configuration with asymmetric channels, on the other hand, can ensure the ideal flow for both media used in the application. Today it is possible to engineer a single plate that can be configured either symmetrically or asymmetrically, thus providing a perfect fit for the specific duty without compromising on mechanical reliability.

Alfa Laval's flexible plate concept, known as the FlexFlow™ design, creates the possibility to configure up to ten different channels for each plate type. This ensures more effective heat transfer, allowing for an even more compact heat exchanger.



PowerArc™

## Reinforced plate rigidity

A number of advancements in manufacturing methods and plate pattern design have enabled the production of more rigid, durable heat exchanger plates. This means that it is now possible to engineer thinner plates that can still tolerate pressure and temperature extremes. Reducing the plate thickness helps to further lower the temperature approach, thereby providing higher thermal performance.

Alfa Laval's PowerArc™ plate pattern divider is one example of an advancement that has allowed for more rigid plate designs with increased reliability in operation. Unlike many suppliers, Alfa Laval also uses a single-step plate pressing process that secures thin, even plate depth in production with lower risk for mechanical stress points.



ClipGrip™

## Improved frame openability

Plate-and-frame heat exchangers are designed to offer easy opening and closing, making it possible to service the unit and address any fouling on the plates. This is crucial to maintaining reliably efficient performance at all times.



Bearing boxes

A wide range of design features now make it significantly easier and quicker to perform service and minimize the associated downtime. Alfa Laval's ClipGrip™ gasket attachment and tightening bolts with bearing boxes are two such examples.







## 4. Conclusion

From reducing capital investment and lifetime operational costs, to boosting production, solving capacity limitations and creating opportunities to sell excess energy, today's state-of-the-art plate heat exchangers offer valuable ways to increase profitability in industrial applications.

However, not all heat exchangers are engineered equally, and it is important to evaluate any new equipment with a critical eye. If a supplier promises efficient performance, be sure to see that their technology contains modern design features that can back up their claims.

If you're interested in learning more about maximizing energy efficiency in your production, or would like to discuss Alfa Laval's range of next-generation gasketed plate heat exchangers, please contact us. You can find further resources and a contact form at

*<https://www.alfalaval.com/demand-new-standards/>*

## About Alfa Laval

Alfa Laval is a leading global provider of specialized products and engineering solutions.

Our equipment, systems and services are dedicated to helping customers to optimize the performance of their processes. Time and time again. We help our customers to heat, cool, separate and transport products such as oil, water, chemicals, beverages, foodstuff, starch and pharmaceuticals.

Our worldwide organization works closely with customers in almost 100 countries to help them stay ahead.

### **How to contact Alfa Laval**

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