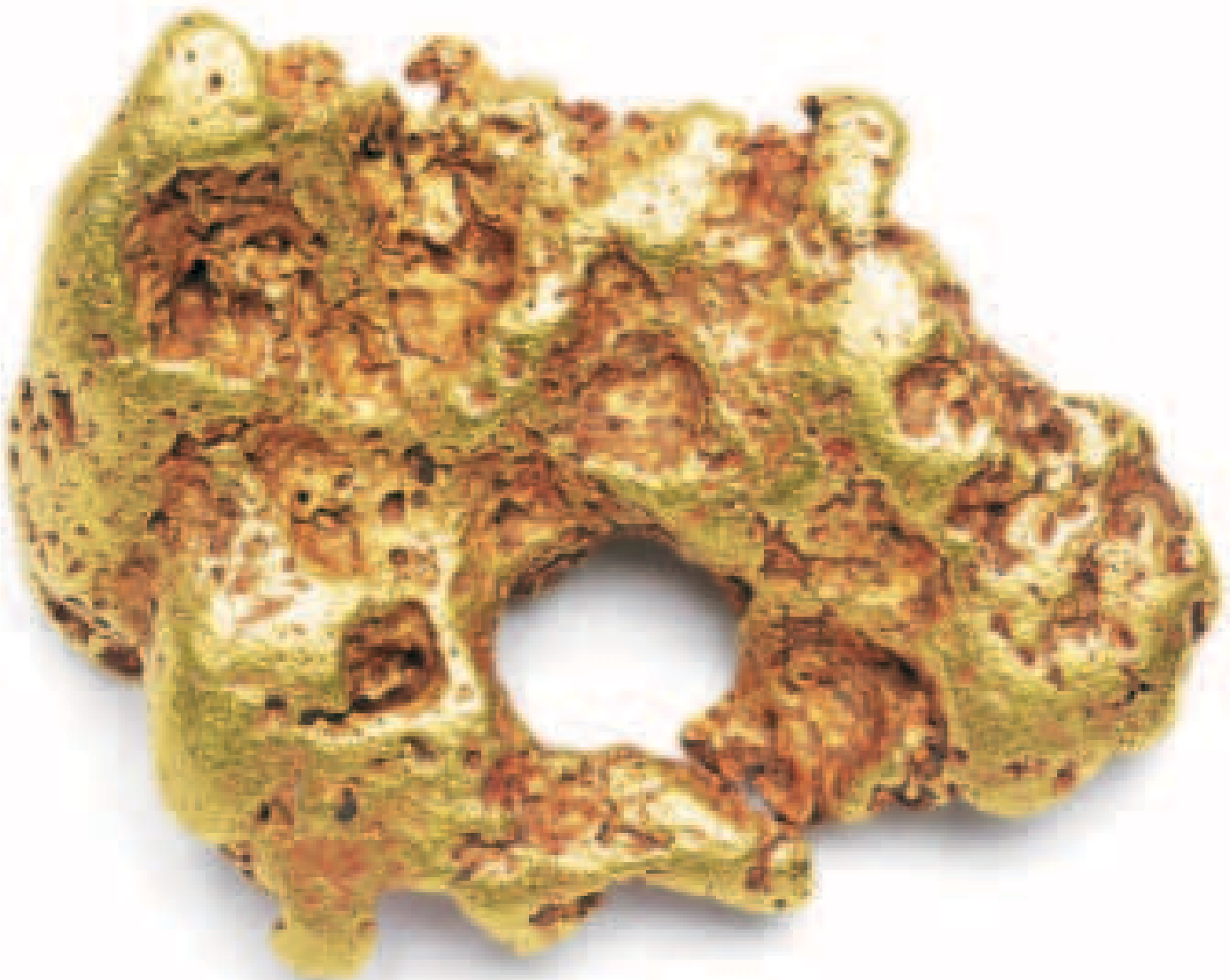




## Hidden treasures

How compact heat exchangers create big advantages in mineral processing



“In a world  
threatened by  
energy shortage  
and global warming,  
recovering industrial  
heat is not only  
profitable.  
It’s a down-right  
responsibility.”



## The hidden treasures of heat recovery

Why are conventional shell-and-tube heat exchangers still commonplace in mineral processing plants?

It's a fair question. Especially when considering the huge energy treasures they are hiding. Replacing them with compact heat exchangers from Alfa Laval – gasketed, welded or spiral – will help uncover those hidden treasures along the entire extraction process, from ore to pure metal.

Welcome to the lucrative world of heat recovery.

### The secret is thermal efficiency

There are many reasons why a heat exchanger from Alfa Laval is able to recover so much more energy than any shell-and-tube unit.

By definition, the turbulence of the media in a plate heat exchanger is much greater than in the shell-and-tube, making the heat transfer more efficient. Also by definition, the temperature approach between the hot and cold sides in a plate or spiral heat exchanger is much closer – down to a mere 2-3°C – because the temperatures of the two sides are able to cross.

As a result, more of the heat emerging from leaching, smelting or converting can be captured and sent back inside, to help heat the incoming media or slurry. The higher internal turbulence in a plate heat exchanger is another factor that sharply increases the thermal efficiency. It also sharply reduces

counter-productive scaling and fouling – and, by the same token, the need for cleaning.

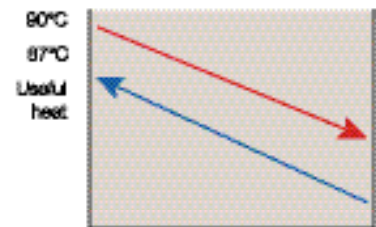
All of these design features add up a heat-transfer coefficient that exceeds the performance of shell-and-tubes by 200-500%.

### More for less.

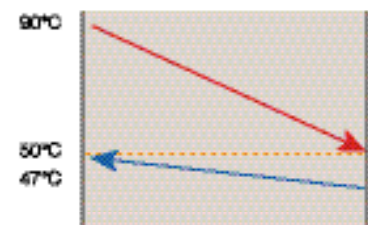
The principle of crossing temperatures in plate heat exchangers is the very foundation of heat recovery. The result is a 30% higher kW output per m<sup>2</sup> of heat-transfer area.

Or put differently: less heat-transfer material is needed to generate a given temperature. Which makes Alfa Laval compact heat exchangers less costly than shell-and-tubes. The cost savings are even more significant when considering the advanced alloys that can be used in compact heat exchangers.

It also shrinks their dimensions and footprints to a fraction of shell-and-tubes with comparable performance.



Thanks to its crossing temperatures and very close temperature approach, a compact heat exchanger is able to recover virtually all of the incoming heat (above). With a shell-and-tube, this is not possible – by design (below).



This frees up valuable floor space that can be used to expand the plant throughput.

### Right for the job.

Alfa Laval offers three types of heat exchangers for mineral processing – gasketed, welded and spiral. Each is optimized for specific duties and operating conditions. Despite different designs, they are all easily accessible for cleaning and maintenance. (In fact, a spiral unit using steam as heat source can clean itself by simply inverting the two flows.)

“Our Alfa Laval heat exchangers are very reliable. They have been operating without any major problems since 1994. There has never even been a need to change any plates.”  
Roberto Villalobos, Maintenance Manager,  
Barrick Zaldívar Copper, Chile



# Killing a few myths about compact heat exchangers

Every so often, plate heat exchangers are the object of negative “common wisdom” concerning their durability and serviceability. Despite their superior thermal performance. Despite their ability to recover enormous amounts of energy. Despite their small footprint. Despite their strong track record around the world.

When it comes to mineral processing, many people still hesitate to trust them. Perhaps it’s time to dissect the “common wisdom” that this hesitation is founded on.

## Heat resistance

Leaching nickel ore generates large amounts of hot steam which can be recovered, condensed and fed back to the incoming flow.

Despite contrary “common wisdom”, plate heat exchangers have no problem dealing with the high temperatures involved. They cope with 180°C – while spiral units are designed for up to 400°C.



A spiral heat exchanger consists of two parallel channels housing counter-current flows.

## Corrosion

A clear misconception is that the corrugated plates in plate heat exchangers would be too thin to with-stand the very corrosive fluids present in mineral processing – for example 98% sulphuric acid. And the high-alloy steels used by Alfa Laval to make the plates are extremely corrosion-resistant.

## Gaskets

Another hesitation relates to the gaskets of plate heat exchangers. “Can they really cope with the aggressive, heavy-duty mineral processing environment

without leaking? Won’t they need to be replaced frequently, at great expense?”

The truth is that Alfa Laval has refined its gasket technology over half a century. The materials, shapes and adhesives of all gasket types has been optimized for different applications – guaranteeing leakage-free performance and long life cycles.

## Cleaning

“Common wisdom” also claims that plate heat exchangers require a lot more cleaning – a job that’s supposedly much more complicated and resource-consuming.

Not true. All Alfa Laval’s gasketed, welded and spiral units are fully accessible from all sides for high-pressure cleaning. And there is a wide variety of plate designs – all optimized for specific processes and fouling risks, to reduce the cleaning need in the first place.

In reality, the high turbulence created by the plate corrugation, keeps the scale suspended and the heat exchanger clean. Thanks to sophisticated design details, every gasketed plate exchanger, regardless of size, can be opened, cleaned and closed again by a single person. It’s quick, safe and effective.

The single-channel design of spiral heat exchangers makes it easy to control velocity and thereby avoid fouling and erosion in slurry duties.



“We use Alfa Laval spiral heat exchangers because they are very strong and very easy to clean – and of course because the thermal efficiency is high. The spirals are turnable so the cleaning is done simply by inverting the two circuits. This means that the product side can be cleaned by the steam going in the opposite direction – without interrupting the process.”

Francisco Tamargo, Technology Manager, Asturiana de Zinc, Spain



## 508 treasures found worldwide – at last count

From Australia to Canada. From Jamaica to Russia. From Zambia to Chile.

Heat exchangers from Alfa Laval are busy uncovering hidden treasures in mineral processing plants across five continents. And Alfa Laval's technical know-how and experience as a supplier to these plants is extensive.

### Alumina

Alfa Laval's first installation in an alumina refinery goes back to 1956. Over 200 heat exchangers are currently operating as liquor interchangers, helping hot pregnant liquor heat the spent liquor. In Australia, one plant is saving 100 megawatts of heating energy this way.

### Copper and zinc

Nearly 250 heat exchangers from Alfa Laval are recovering heat from the leaching and electrowinning processes in copper and zinc production. In Chile, one plant is saving 48 MW per year simply by interchanging heat from the electrowinning step and feeding it

back to the leaching step. Another plant in Finland is recovering excess heat from the sulphuric acid production for heating the electro-winning cell. Result: 8 megawatts saved.

### Nickel

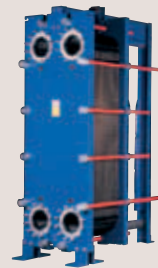
Well over 50 Alfa Laval compact heat exchangers are recovering heating energy in nickel processing. One plant in Australia uses them as interchangers to cool the leach medium (NH<sub>3</sub>) while heating the boiler feed in other parts of the process. The bottom line shows 15 megawatts of energy saved.

### Your global partner

With our network of more than 50 service centres around the world, we are always close to our customers, regardless of where in the world they do business. This means we can respond faster to their needs and inquiries. Our process specialists can advise about materials, gaskets and fouling margins. And our service organization can ensure the right maintenance and most reliable deliveries of spare parts.

### Product facts

Heat exchangers from Alfa Laval



Gasketed plate heat exchangers are ideal for high-yield heat recovery from various fluids. Their open design makes them easily accessible for maintenance and capacity expansion.



Welded plate heat exchangers are gasket-free to handle the most aggressive fluids and temperatures.



Spiral heat exchangers operate with counter-current flows in single channels. They are designed to handle very coarse, fouling slurries at high temperatures and/or high pressure.



Alfa Laval operates more than 50 service and spare-part centers worldwide, minimizing the distance to customers and their Alfa Laval installations.

## **Alfa Laval in brief**

Alfa Laval is a leading global provider of specialized products and engineered 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, foodstuffs, starch and pharmaceuticals.

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

## **How to contact Alfa Laval**

Up-to-date Alfa Laval contact details for all countries are always available on our website at [www.alfalaval.com](http://www.alfalaval.com)