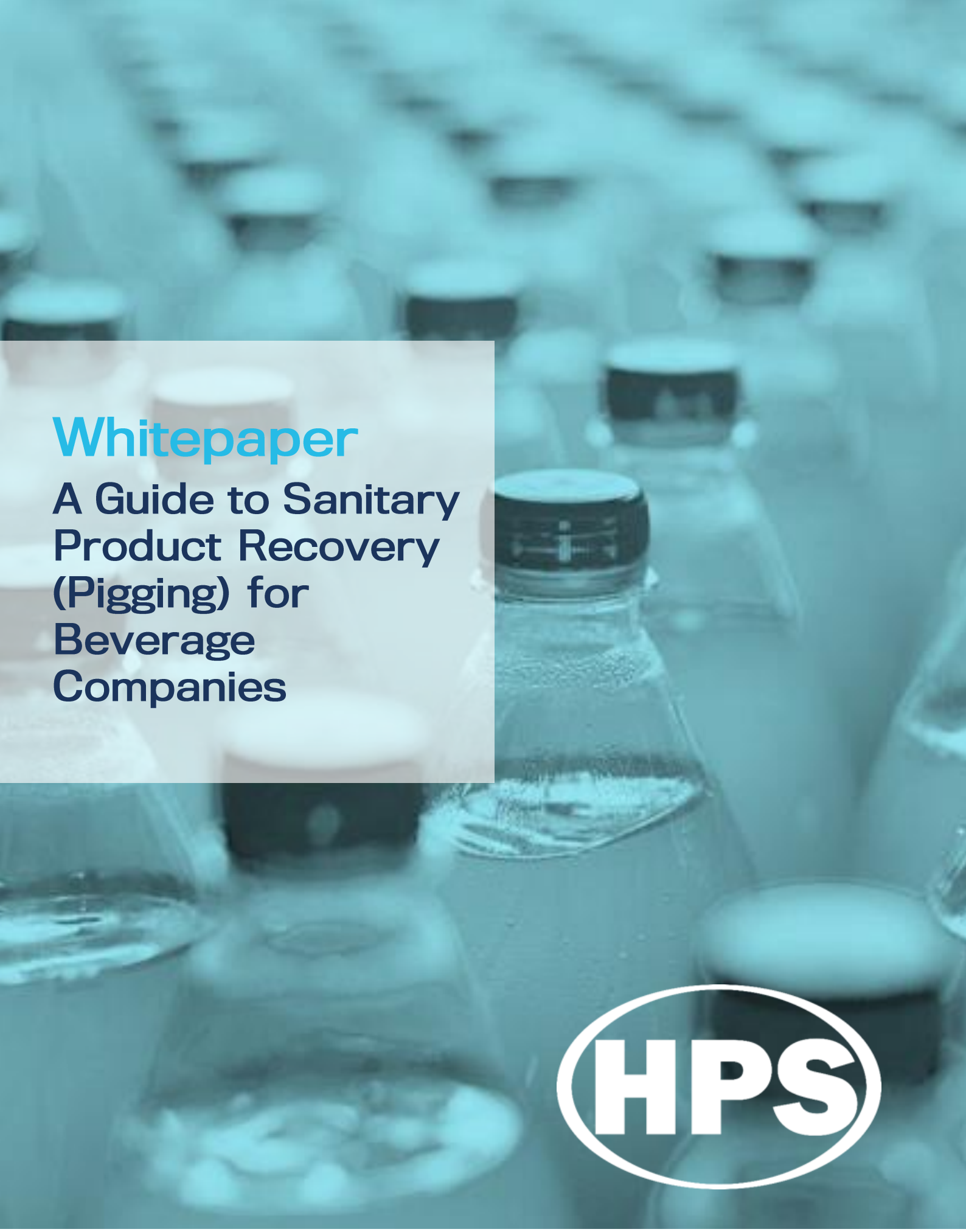


Whitepaper

A Guide to Sanitary Product Recovery (Pigging) for Beverage Companies

HPS

Summary

With raw material prices constantly fluctuating, competition increasing, margins getting tighter and the need to reduce waste and meet sustainability goals, manufacturers are realizing the significant cost savings and efficiency gains they can achieve by recovering product from their pipelines, instead of wasting it. In a wide range of industries that process liquids, liquid product recovery ("pigging") has become a must.

Sanitary pigging is one of the most effective ways to increase product yields, reduce waste, save water, and speed up changeover times. And because pigging saves product and other resources, it has a positive impact on the environment and helps companies towards their sustainability goals. Sanitary product recovery and pigging systems are particularly effective, and in wide use, in beverage processing and production.

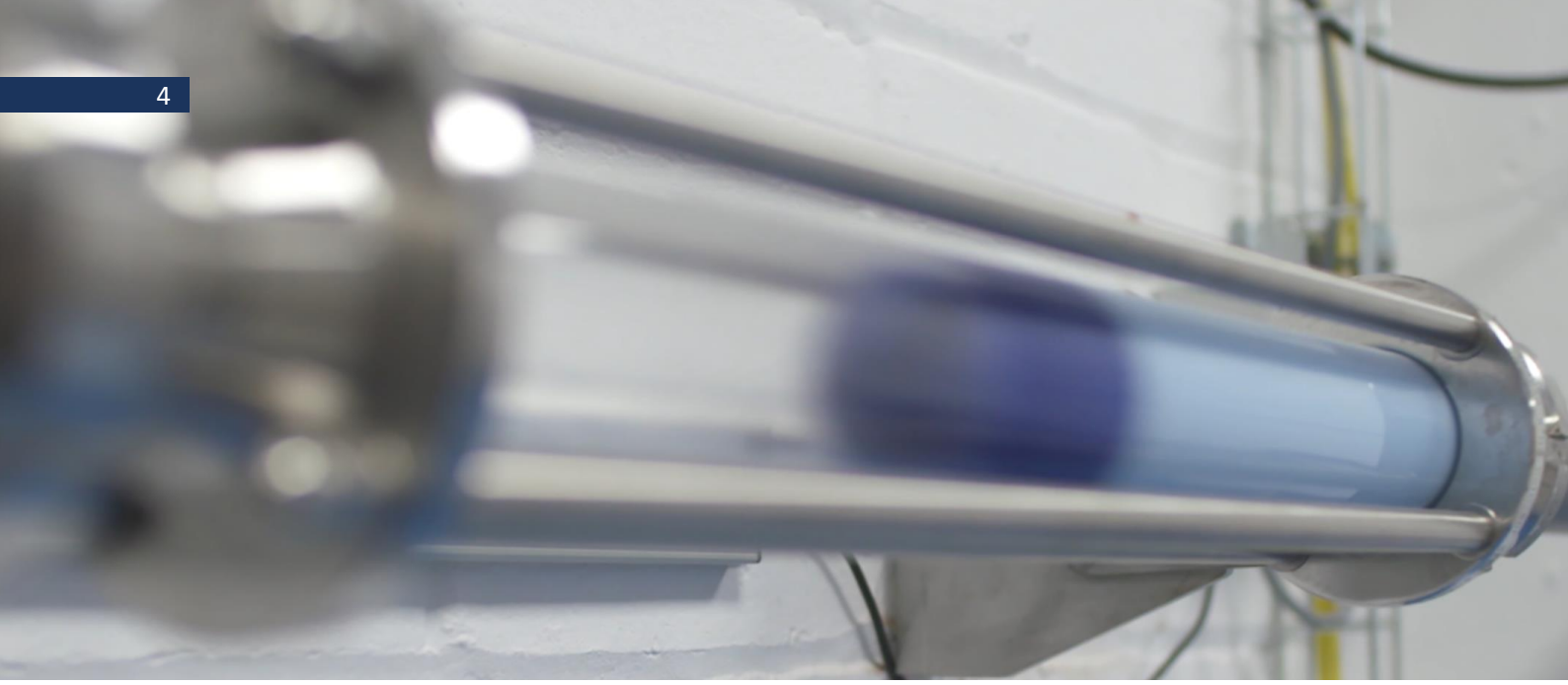
As well as improving efficiency and profits, pigging has additional benefits to beverage producers such as preventing product aeration and foaming, reducing oxidation and cross-contamination risks.

From beer, cider, spirits and sodas to fruit juice, wine, and sports drinks, HPS pigging systems deliver rapid payback and return on investment.

This guide provides an overview of sanitary (often called hygienic) pigging for the beverage industry. It includes an introduction to how pigging works, the benefits of pigging, types of sanitary pigging system. It also includes types of pig, how to plan a pigging project, plus much more.

Key Statistics

- ✓ The highest quality pigging systems typically recover up to **99.5%** of useable, residual liquid from pipes. This recovered liquid can continue to be processed, packaged and sold.
- ✓ Payback from Pigging Systems is typically less than 12 months, delivering a high ROI.
- ✓ There are different types of pigging system, from simple source-to-destination solutions to multiple-source and multiple-destination projects.
- ✓ Nearly all pigging and liquid transfer solutions are bespoke, and most are either semi or fully automatic.
- ✓ Pigging is effective – a well-known soft drinks company massively increased product yield, equating to approximately **48,000 extra cans per week.** If it wasn't for pigging, the product would otherwise be wasted or become effluent.
- ✓ A bottling plant implemented a Pigging System and now saves an average of **256,000 liters** of wine every year.
- ✓ As well as saving product, pigging saves water. For example, an Australian winery saves over **40 million liters** of water each year, along with wine savings of approximately **40,000 liters.**
- ✓ Savings are significant. A leading soft drinks company implemented a pigging system which is saving them roughly **$31,500 a day**.
- ✓ Pigging reduces waste and its associated costs. A wine processor has reduced effluent production by roughly **1,500 liters** per bottling run, which equates to around **500,000 liters** per year.
- ✓ By reducing waste and improving efficiency, pigging improves environmental sustainability.



What is Pigging?

If you drink wine, beer, spirits, fruit juices, cola, or other types of soft drinks; if you eat chocolate, sweets, ready meals, dips, sauces, yoghurt, soup, or honey; or if you use paint, varnish, shampoo, cosmetics, toothpaste, washing up liquid or other household product, then the chances are you've drunk, eaten or used something that's been 'pigged' during its processing or production.

In the beverage industry, sanitary pigging recovers residual liquid product from pipes. If it wasn't recovered by pigging, this liquid would go to waste. This product is perfectly useable so can be sold or continue to be processed along with the rest of the batch, rather than being flushed down the drain.

How Pigging Works

In its simplest form, a pigging system consists of a solid projectile (the 'pig') with a diameter slightly larger than the pipeline transporting the liquid. The pigging process introduces this pig into the pipeline (usually automatically) and pushes it through the pipe.

To 'pig' a system, pigs are propelled through the pipe by pressurizing the pipework behind it. Compressed air, carbon dioxide, nitrogen, clean water or even the next product (depending on the application) provide the pressure. Instead of being flushed to drain, waste treatment or collection areas, the liquid residue in the pipe is recovered: pushed by the pig and forced to the destination filler or tank, or returned to source, to continue processing along with the rest of the product.

HPS pigs, which are the benchmark of the industry, recover up to 99.5% of product. As well as increasing yields, pigging at this level also reduces the need for water flush and clean-in-place, saving time, labor, water, cleaning fluids and waste disposal costs.

Benefits of Pigging

Sanitary Pigging and Product Recovery Systems deliver a wide range of benefits and a high return on investment.

Higher Product Yields

Increased product yield is one of the most common reasons organizations use a pigging system.

Whenever a process transfers liquid along a pipe, there's nearly always product residue left in the pipe. Even gravity fed lines don't evacuate all the product. The more viscous the product, the more residue there is. Pigging systems will help you recover nearly all this residue, as useable product.

As an example, HPS provided an automatic pigging system for a soft drink manufacturer located in Costa Rica. The pigging system is saving the company roughly **$31,500 a day**. HPS also provided three fully automatic pigging systems for a plant that manufactures one of the world's most popular fizzy drinks. Each system delivers product from any one of four tanks to a filling machine. The three pigging systems delivered a **4%** increase in product yield, equating to **48,000 extra cans** per week.

Increased Efficiency and Profits

Because pigging systems recover significant amounts of useable product from processes, there's more product to sell. Alternatively, less is required to achieve the same output.

In addition to increased profits, pigging systems streamline processing; reducing effort required and making various operations a lot quicker. They can even eliminate some process stages altogether, for example dismantling pipework or flush outs.

Typically, a correctly designed and implemented pigging solution will pay back the initial cost of the system within one year. Good quality pigging systems last a long time (some HPS systems are still in use after 20 years), so return on investment is significant.

For example, a large chocolate manufacturer in California uses a combination of semi-automated and fully automated pigging systems in a range of sizes. These systems massively increase efficiency, reduce the risk of human error, speed up processing and changeovers, and minimize waste.

Increased Production Capacity

Manufacturers of beverages pump many different formulations and configurations of product. However, it's inefficient to have a dedicated line or lines for each product.

Because HPS pigging systems recover nearly all residual product from the pipeline(s), this enables the same lines to be used for more than one product and reduces the number of dedicated lines there are. So, the many dedicated lines can be replaced with a lower number of shared lines. This increases the capacity and flexibility of operations and enables manufacturers to meet the demand for greater product variety. It also reduces the costs of new installations.

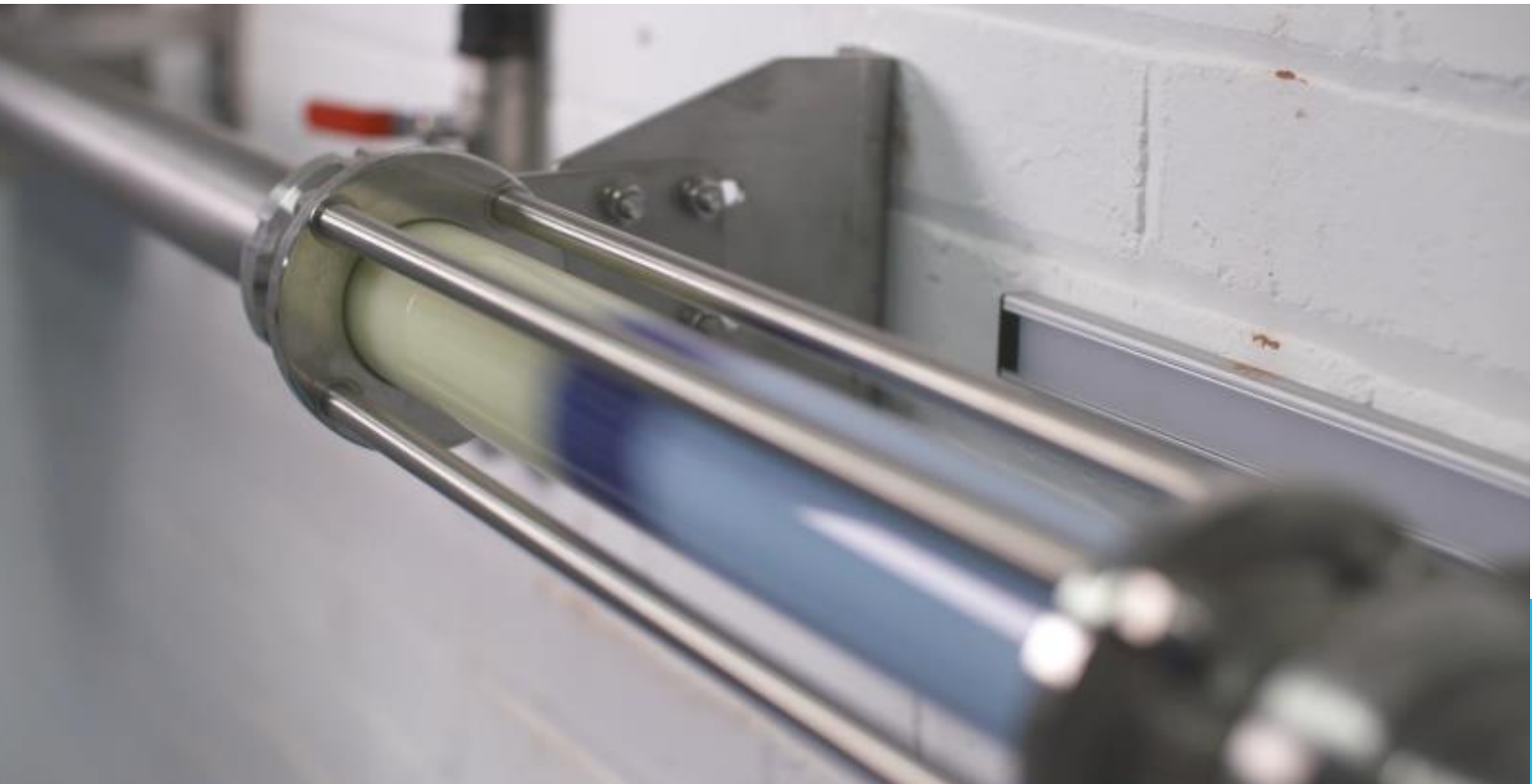
Faster Changeovers

When companies expand product ranges, it's often desirable to use previously dedicated pipelines. However, changeover from one batch to another can account for significant product loss, high wastage costs and less productive human-resource hours.

Pigging speeds up product changeovers because it reduces the length of the wash. If there is only a slight change in product color or flavor it is often possible to follow on immediately with the next product after pigging, eliminating the need for flushing altogether.

Lower Cleaning and Labor Costs

Pigging reduces the effort and resources needed to clean pipelines. Because there's less product to remove, it is quicker and requires less labor. It also speeds up changeover times so there's less downtime. Semi-automated and fully automated pigging systems reduce labor costs even further.



Reduced Cross-Contamination Risks

Because HPS pigging systems have high product recovery rates, the chances of product contamination and cross-contamination are greatly reduced. This in turn means more consistent product output, lower rework and better control over raw material and finished product inventory are among the many benefits of pigging systems.

In product-to-product pushes, pigging minimizes mixing and dilution, which improves quality as well as saving operator time. This in turn reduces the risk of failing audits and expensive product recalls.

Reduced Waste Processing

By increasing product yields through pigging, there's less product to send to waste. What's more, the cleaning and changeover processes also use less cleaning fluids. In this way, sanitary product recovery and pigging systems directly reduce waste processing costs. For example, an Australian winery has reduced effluent production by **1,500 liters** per bottling run, which equates to around **500,000 liters per year**.

Reduced Water Usage

Often the first part of a clean-in-place cycle is to flush out the product residue with water for a period of time before actually proceeding with the cleaning process. If most of the product has already been removed by pigging, then there's no requirement for a lengthy flush out. This reduces water usage significantly.

For example, a well-known wine producer, which has a number of HPS systems in place, estimates that they are finding water savings of around **40 million liters** per year, in addition to wine savings of **440,000 liters** per year.

Positive Environmental Impact

Many beverage companies have strong environmental initiatives. Therefore, the positive environmental impact of pigging is a key benefit to many of these producers and processors.

As well as forming part of an ethical business strategy, being environmentally responsible is increasingly important to consumers, employees and other company stakeholders.

The costs of removal or treatment of waste from plants has become a major expense to many liquid processing companies. Additionally, changes in legislation and environmental policies can lead to companies deploying extra resources and incurring further cost. An effective way of reducing these costs, while reducing carbon footprint and improving sustainability, is to pig the product transfer pipelines. This significantly reduces waste and associated costs.

Pigging saves water and saves energy. It reduces the use of harmful chemicals and associated disposal requirements. It also means fewer trucks on the road. In practical terms, the positive environmental benefits of pigging are considerable.

Prevention of Aeration, Foaming and Dissolved Oxygen

As liquid travels through a pipeline, the flow is usually turbulent. If there's air in the pipe, it can mix with the liquid, and the liquid becomes aerated. With certain liquids, even a small amount of air or gas can cause foaming. Others can be degraded or rendered unusable if they come into contact with air. Dissolved oxygen is a particular problem with wine, for example.

One of the most effective ways to prevent liquid coming in to contact with air during processing is to use a double-pig system.

Types of Pigging Systems

Pigging systems can be deployed in existing plants, as well as part of new projects or installations.

Because every company's processes and systems are different, every pigging system implementation is bespoke; there's no such thing as an effective 'off-the-shelf' sanitary pigging system. However, in beverage processing, pigging systems tend to fall in to one of these categories:

- ✓ Single-Pig Systems
- ✓ Double-Pig Systems
- ✓ Dual-Pig Systems
- ✓ Tank Drop-Off Systems

While these systems can be controlled manually or semi-automatically, most are controlled fully automatically. In particular, double-pig and tank drop-off systems are nearly always fully automatic.

Key System Components

Pigging systems include a variety of components, including launch and receive stations, specialist valves, propellant supplies, pig detectors, control software, PLCs and so on. However, one of the most important components is the pig (or pigs). There is a variety of pigs available for sanitary and hygienic applications.

Pigs

For use with beverages and food, pigs need to be manufactured from food grade material.

They should allow steam cleaning to a reasonable temperature without degradation. While being flexible (so that they can travel around bends and still efficiently recover product), they should not include caps or assembled components that could catch, break or fall off. Similarly, finned pigs should be avoided. This is because the fins tend to rip or have small pieces break off, while effectively cleaning between the fins is also difficult.

To enable full automation, pigs should be fully detectable and ideally be provided with a purpose-designed pig detection system. In addition, they should also be bi-directional.

To reduce contamination risks, pigs should not contain any solid magnets. Solid magnets and other assembled parts can break free from the pig and contaminate the product. For example, HPS pigs have a flexible silicone-based magnetic core, which will not shatter and so avoids the risk of contaminating the processed product with fragments of magnets. This flexibility also means the pig can travel around 1.5 D bends while still efficiently recovering product.

About HPS

HPS is the world's leading specialist in pigging, liquid product recovery and transfer systems for manufacturers, producers, and processors of beverages. This includes sodas, juices, syrups, energy drinks, beer, wine, cider and spirits and many other products.

HPS clients include Coca-Cola, Britvic, Orlando Wines, Pepsico, Glenmorangie, Campari, Buffalo Trace, and many others. There are thousands of HPS systems in use throughout the world.

Established in 1995, HPS has extensive experience in beverage processing which ensures highly efficient, reliable and cost-effective operation.

HPS head office is in the UK. The company also has offices in the US and Australia, and a network of agents and official representatives throughout the world.

In addition to beverage companies, HPS also delivers product recovery, liquid transfer and pigging solutions to food, confectionery, homecare, personal care, cosmetics, paint, pet food and other industries.

You can't take risks with your processes. That's why HPS engineers will work with you to ensure your solution meets your operational requirements – *before you deploy it.* For more information, please see our contact details on the next page or **click here to find your nearest HPS office, agent or representative**.

Our Customers