



A Guide to Sanitary Product Recovery (Pigging) for

# Pet Food Manufacturers



**HPS Product Recovery Solutions**

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## Summary

For companies that process liquids and 'wet' products such as meat emulsions, sanitary product recovery ("pigging") is one of the most effective ways to recover product, improve product yields, speed up processing, reduce waste and minimize product mixing and contamination risks. And because pigging saves product and other resources, it has a positive impact on the environment and helps companies progress towards sustainability goals.

Sanitary product recovery and pigging systems are particularly effective, and in wide use, in pet food processing and production. That's because pet food companies can achieve significant gains from product recovery and the efficiency improvements provided by HPS pigging solutions.

As well as improving efficiency, productivity and profits, pigging systems also offer a wide variety of additional benefits to pet food manufacturers such as speeding up changeover times, increasing capacity, reducing run-off in product-to-product push systems, improving product quality and consistency (helping to pass audits and avoid recalls) and flexibility of operations.

This guide provides an overview of sanitary (often called hygienic) pigging for the pet food industry. It includes an introduction to how pigging works, the benefits of pigging, types of sanitary pigging system and types of pig, and how to plan a pigging project. It also has sources of further information.



## Key Statistics and Takeaways:

- ✓ 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 used in pet food processing 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 systems are bespoke, and most are either semi or fully automatic.
- ✓ A well-known Australian pet food manufacturer, which processes hot meat slurry with 2.5-inch pipe over 100 feet, is estimated to save roughly **\$42,000 AUS per year in product alone**. This is in addition to savings from faster changeovers and reduced downtime, and savings from lower CIP and water usage.
- ✓ The increase in yield is also the same volume of product not sent to drain, which amounts to a **significant decrease in waste discharge** and the **associated waste handling and disposal costs**.
- ✓ Pigging also **increases product quality and consistency**, because pigging product or water residue after a flushouts or CIP greatly **reduces risk of product dilution** and operators having to guess the interface correctly.
- ✓ A UK pet food manufacturer used a product-to-product push system from silos to filler and was losing significant amounts of product as run-off. **Incorporating pigging saves over a pipeline full of run-off each changeover**, prevents mixing and cross-contamination, saves labor, speeds up changeovers, and reduces risks of failed audits
- ✓ A well-known pet food manufacturer within the EU uses automatic pigging in its 3-inch pouch making lines. It is estimated that this **saves €60,000 per year in product alone**. This is in addition to savings from faster changeovers and less production downtime, and savings from lower CIP and water usage.





## What Is Pigging?

If you process meat emulsions, wet ingredients, or are pumping product and not 'pigging', then you probably should be. By not pigging you are almost certainly losing money, wasting time and flushing valuable product away!

In the pet food industry, sanitary pigging recovers residual liquid product from pipelines. If it wasn't recovered by pigging, this liquid would go to waste. This recovered 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 or otherwise disposed of.

## 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 speeds up changeovers, reduces cross-contamination risks, while saving time, labor, water, and waste disposal costs.



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# Benefits of Pigging

**Pigging Increases the Profits, Capacity, Efficiency and Sustainability of Pet Food Manufacturers through:**

- ✓ Increased Productivity and Efficiency
- ✓ Higher Product Yields
- ✓ Lower Labor Costs
- ✓ Less Downtime
- ✓ Reduced Waste Processing
- ✓ Lower Cleaning Costs
- ✓ Faster Changeovers
- ✓ Improved Product Quality
- ✓ Reduction in Product Recall Risk and Audit Fails
- ✓ Reduced Water Usage
- ✓ Reliable Prevention of Cross-Contamination
- ✓ Minimizes Product Mixing, Dilution and Interface
- ✓ Higher Capacity and Increased Flexibility
- ✓ Improved Lot Traceability and Batch Control

## Increased Productivity and Efficiency

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.



## 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.

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As an example, HPS provided pigging systems to a well-known Australian pet food manufacturer. This pet food manufacturer processes hot meat slurry, pumping it through 2.5-inch pipe over 100 feet. **In product alone, the manufacturer is estimated to save roughly \$42,000 AUS per year.** This is in addition to savings from faster changeovers and increase in available production time, and savings from lower CIP and water usage.



In product to product push systems, **pigging minimizes the product interface so reduces waste from mixed product.** This increases yields, efficiency and product quality. It also **removes the need to visually inspect the mixed product** (old product and new product) as it is sent to drain. In product to product systems, the longer the line and the greater its diameter, the more there is to gain from pigging.



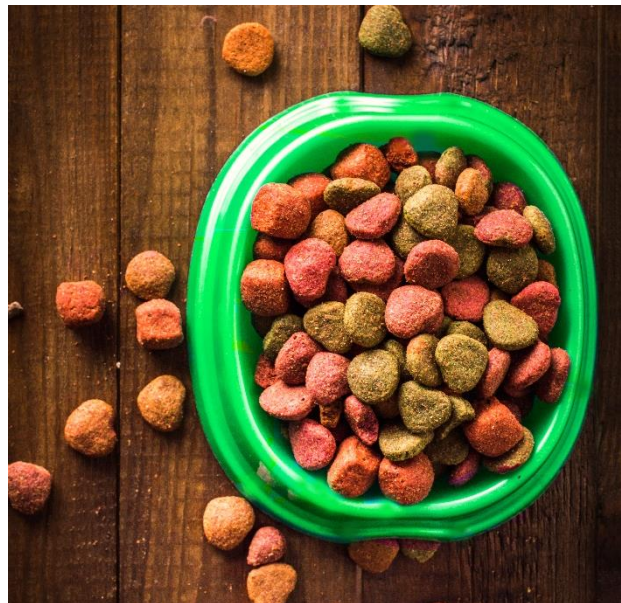
As an example, a UK pet food manufacturer used a product-to-product push system from silos to filler and was losing significant amounts of product as run-off. It was labor intensive and needed a person to monitor the product as it was sent to drain (to ensure that only new product was being delivered to the filler/destination).

Incorporating pigging saves over a pipeline full of run-off each changeover, prevents mixing and cross-contamination, speeds up changeovers, eliminates the need for an operator to monitor the mix, improving quality and reducing risks of failed audits.

## Higher Capacity and Increased Flexibility

Many pet food manufacturers pump many different formulations and configurations of pet food. 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 so 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. It also reduces the costs of new installations.





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As an example, a well-known pet food manufacturer within the EU uses automatic pigging in its 3-inch pouch making lines. They use water flush outs and CIP. It is **estimated that pigging saves €60,000 per year in product alone**. This is in addition to savings from faster changeovers and increased available production time, and savings from lower CIP and water usage.



## 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. In pet food in particular, product-to-product push is quite common.

Therefore, **pigging eliminates having to flush the remnants of the last product batch to drain**, when pumping new product to its destination.



## 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.

## Improved Product Quality

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.



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## Improved Lot Traceability and Batch Control

Pigging significantly reduces cross-contamination risks while helping lot traceability and batch control. Achieving accurate lot traceability and batch traceability isn't always easy when pumping pet food products. Nevertheless, they are still important, because if a contamination or cross-contamination incident does occur, it's crucial to be able to find the precise location and cause of the problem.

Pigging systems help lot traceability and batch control, as they segment and differentiate batches by creating clear barriers between them. In this way, pigging will significantly reduce costs, especially if a recall or other problems occur.

## Reduced Waste Processing

Because pigging systems recover up to 99.5% of product that remains in the line after changeovers, there's less product to send to waste. This significantly reduces waste processing and the associated costs. It also reduces water usage for those pet manufacturers who use water in any part of their cleaning process.



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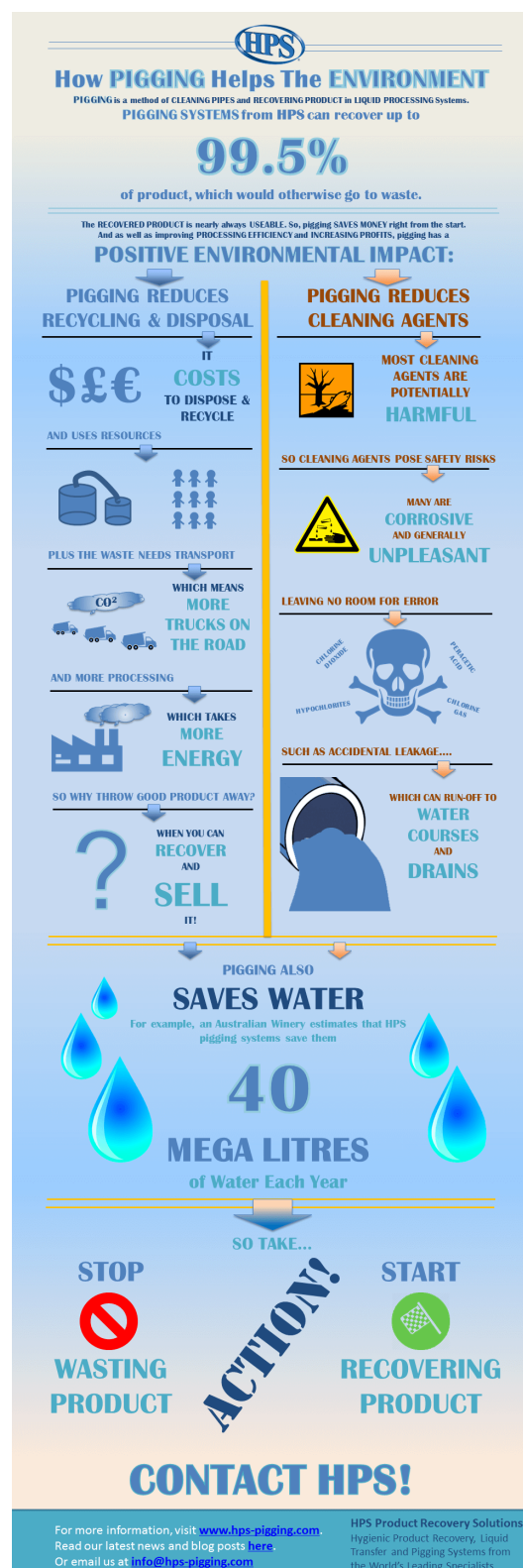
## Positive Environmental Impact

Many pet food 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.



*How Pigging Helps the Environment*

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*"The solution was simple to use. The HMI was customizable to suit our needs and everyone we dealt with from sales to parts to installation and programming was fantastic to work with"*

## Types of Pigging System

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

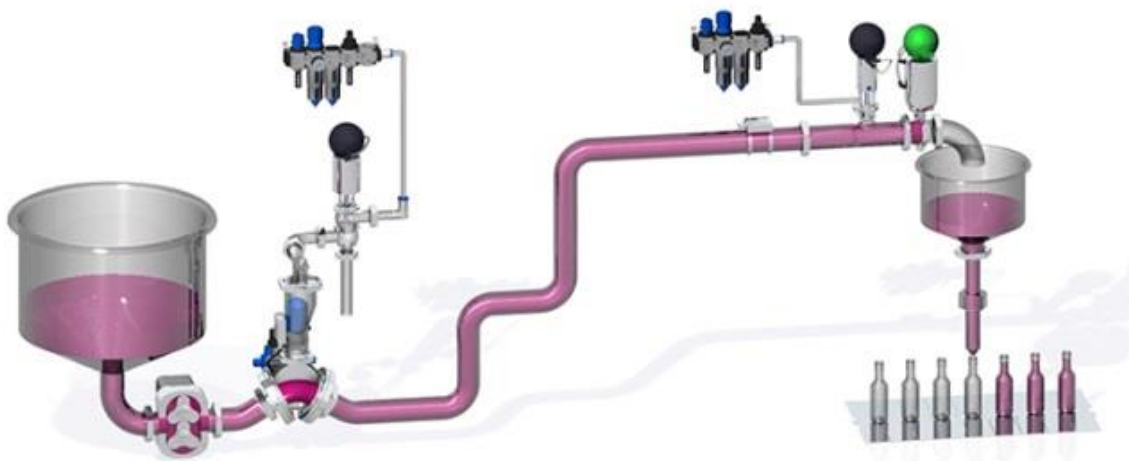
Because every company's processes and systems are different, every pigging system implementation is bespoke; there's no such thing as an effective 'off-the-shelf' sanitary pigging system. However, in pet food processing, pigging systems tend to fall in to one of three categories:

- ✓ Single-Pig Systems
- ✓ Double-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.

### Single-Pig System

Single-pig systems are the most common type of pipeline product recovery solution. They are also the simplest; generally sending one pig from one source to one destination when the main product transfer process has paused or finished.



*Single-pig System*

In a single-pig system, the pig can either send recovered product to the destination (for example a tank) or back to the source tank.

### Double-Pig System

The double-pig system is typically used for processes where the product cannot come into contact with air. This is either because air contact may degrade the product, for example increasing the dissolved oxygen content in wine, or because the product has a tendency to aerate or foam, which can cause processing problems or delays.



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Double-pig systems, as the name suggests, use two separate pigs. The sequence of each pig travelling through the pipe ensures that the system recovers residual product and transfers product efficiently, while always using the pigs to seal the product from air in the pipe, so avoiding air contact and aeration.

Products commonly associated with a double-pig system include wine, beer and foam gel products.



*Double-pig System*

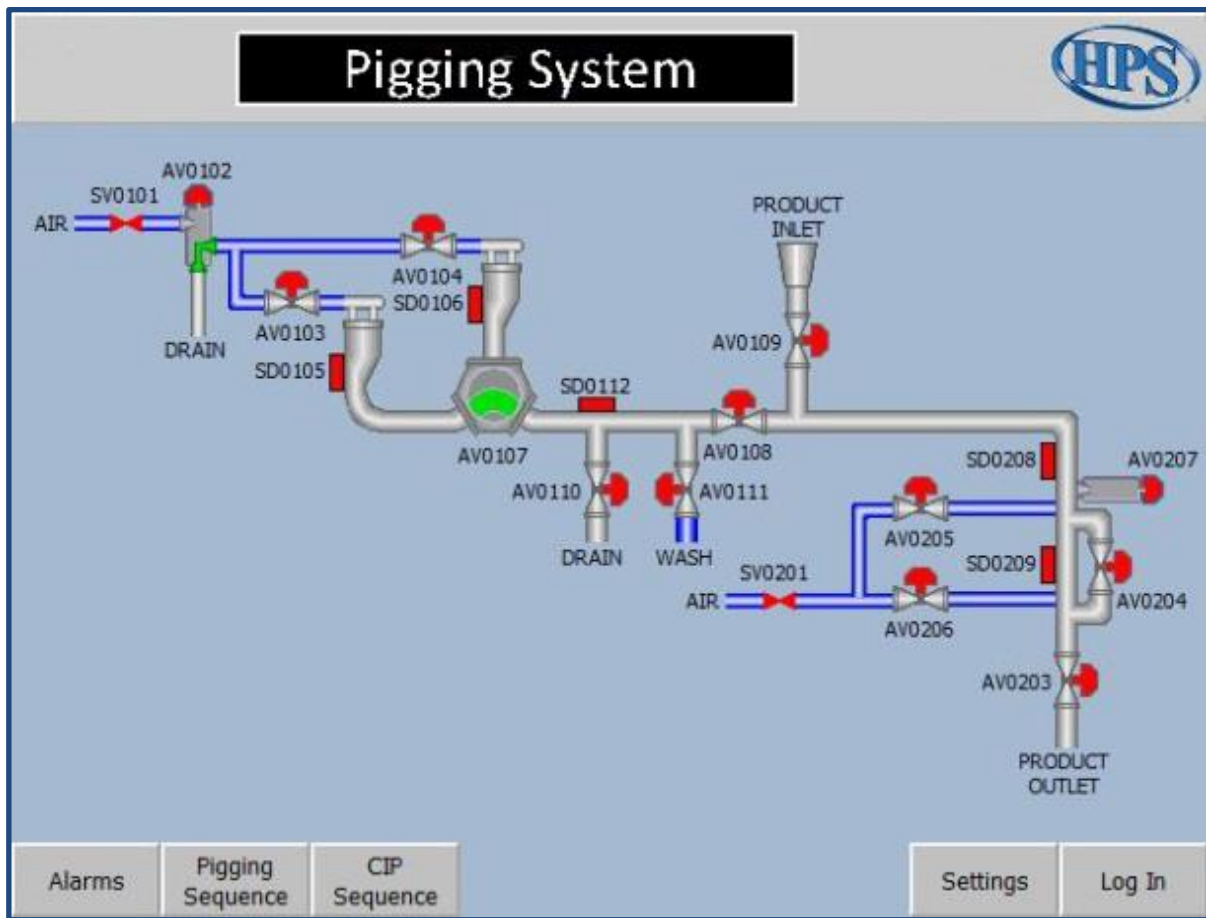
## Tank Drop-off

Tank drop-off systems are similar to single-pig systems, but incorporate multiple destinations on the same line, rather than a single destination.

There is no limit on the number of drop-offs. After transfer to a tank, the automatic pigging sequence sends a pig to a blocking valve at the appropriate tank. Any blocking valves between the destination and the pig are opened to allow for a clear route. The pig is then returned with the same receive return station used on a single-pig system.

For more detailed information about the different types of pigging system, including video animations, please visit <https://www.hps-pigging.com/pigging-system-demonstration-videos/>

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*Tank Drop-off HMI Screen*



## Types of Pigs

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.

### Basic Requirements

HPS patented process pigs are specially designed for highly effective, reliable and efficient sanitary (and hygienic) pipe line pigging. 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 ideally be solid; that is, 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.



### Detection

To enable full automation, pigs should be fully detectable and ideally be provided with a purpose-designed pig detection system. As well as being detectable, 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 silicon-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.

***“HPS Pig materials have been validated several times and shown to give longevity of operation and security of product”***

- P&G

### Reliability and Effectiveness

Like any component, pigs should have a long working life and include a minimum usage guarantee. They should be available in a range of sizes to suit different pipeline specifications. Above all, they should be effective. They should maintain full body contact with the inside of the pipe and recover upwards of 99% of product.





# Planning a Pigging System

Compared to many systems, implementing a product recovery or pigging solution is relatively straightforward. However, to ensure your project runs smoothly, here are some factors to consider at the initial stages of your project.

## Aims and Objectives

While efficient product recovery is a key driver to most pigging system projects, overall objectives often include reducing environmental impact, streamlining operations, increasing efficiency or profit maximisation. Objectives that are more specific typically include improved pipe cleaning, increasing overall processing speed, and reduction of cleaning product use. However, these objectives vary depending on application. For example, a pet food processor may focus on increasing product yields and improving the efficiency of their operations, while a confectionery company that uses high-cost ingredients may focus on eliminating as much product waste as possible.



Being clear about your objectives will ensure your pigging system design meets your needs.

## Your Products

As well as the type of products you process, effective pigging system design will require information about typical operating temperatures, viscosity, pumping pressures and so on.

## Your Current Operation

Before recommending a pigging solution, it is important to outline to your pigging system provider how your current liquid processing system is set up. For example, how many product sources you have, how many destinations, the approximate distance between each, how you currently clean between changeovers, changeover frequency and so on. It is also important to consider future additions or changes to your processing, and any plans for plant expansion.

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## Existing Pipeline Infrastructure

The dimensions, material and condition of your existing pipeline infrastructure will directly influence the design of your pigging system. We recommend you consider the following points before implementing a pigging system, as well as during the life of the system:

- ✓ Make sure the length of the pipe you are intending to pig is free from dents and damage.
- ✓ Welds must be clean and have minimal intrusion into the internal bore of the pipe.
- ✓ To prevent progressive damage to the pigged pipe, use anti-vibration cushion-sleeve pipe support clamps instead of metal-on-metal clamps.
- ✓ Instead of rod hangers, use rigid supports such as 'L' frames for the pigged pipe. This will prevent possible movement of the pipe while the sanitary pigs are propelled through it.
- ✓ If you're using compressed air, carbon dioxide or nitrogen to propel the pig, use rigid air pipe rather than flexible air lines (flexible air lines can get distorted and prevent air flow).

## Existing Services

There are different ways to propel pigs. The most common is by using compressed air or using a gas such as nitrogen or carbon dioxide. Other methods of propelling pigs include water or even the next product to be processed. It is usually preferable to use existing services if possible, so take a note of the compressed air, gas or other services you have available, including their rating.

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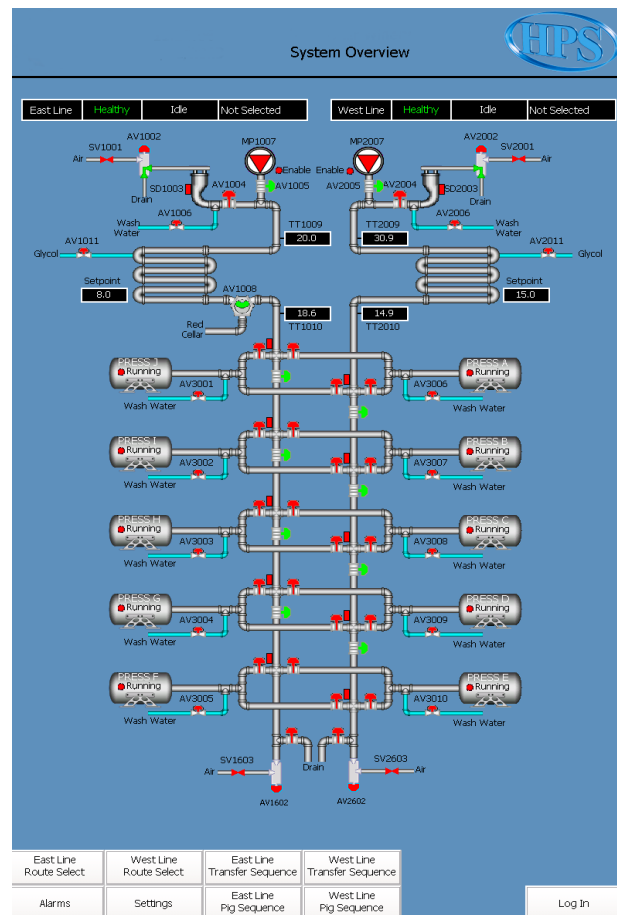
## Pigging System Automation

Automated pigging systems are more efficient, more reliable, easier to run and safer than manual systems. You may have your own PLC, SCADA or HMI system specialists that will be able to set up programming and control for you. Alternatively, you can ask your chosen pigging system provider to set up the automation for you.

Pigging system automation systems can be standalone or integrated.

Standalone systems have a separate panel from the existing set up to automatically control the pigging process. Although standalone, it is possible to set up communications to pass data from one PLC to another. It is also possible to hard wire any interlocks and other safety features into the panel.

If there is space on an existing PLC and HMI for integration, it is usually possible to merge the pigging system automation code into it.



## Use a Specialist

Although the principles of pigging are straightforward, it takes many years of experience and high levels of expertise to successfully design and implement a pigging system. That's why, if you're considering a pigging solution for your organization, you should always work with a specialist sanitary product recovery company.

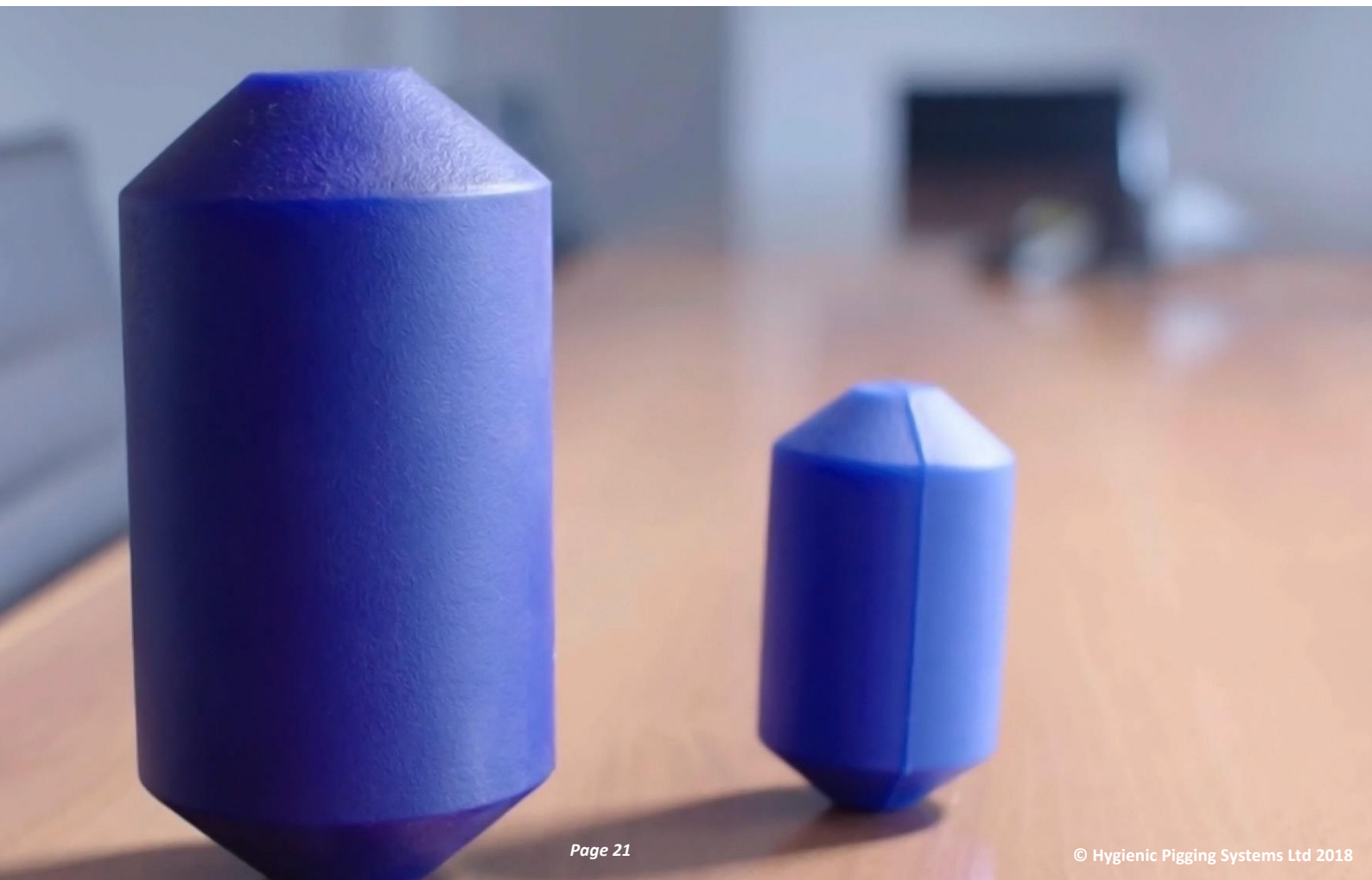




## Further Information

There's a wealth of information about Sanitary Pigging and Product Recovery on the [HPS Website](#). Here are some of the most popular articles:

- [Pigging – What Is It](#)
- [Benefits of Pigging](#)
- [Types of Pigging System and Demonstration Videos](#)
- [Sanitary \(Hygienic\) Pigs](#)
- [Pigging System Savings Calculator](#)
- [How Pigging Helps the Environment \(with Infographic\)](#)
- [Ensuring Pet Food Safety in a Booming Market](#)
- [Clean Label Food Trend and the Pet Food Industry](#)
- [Sustainability in Pet Food Manufacture](#)
- [Pipeline Infrastructure for Pigging Systems](#)
- [Pigging System Case Studies](#)
- [Pigging and Product Recovery FAQ's](#)
- [Myths About Pigging](#)
- [Get a Pigging System Quote](#)



## About HPS Product Recovery Solutions

HPS are world-leading specialists in pipeline cleaning, product recovery and transfer for pet food processors. We also have extensive experience in the pet food processing industry.

HPS clients include Nestle Purina, Mars Pet Care, GA Pet Food Partners, Butcher's, C&D Foods, plus many more. There are thousands of HPS systems in use throughout the world.



Established in 1995, HPS has extensive experience in pet food 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 pet food companies, HPS also delivers product recovery, liquid transfer and pigging solutions to food and beverage, homecare, personal care, paint 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](#).





## A Guide to Sanitary Pigging for Pet Food Manufacturers

Here are some of our pet food customers



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*You can also find us on:*

