What is a Pipeline Pig and how are they used?

Pipeline Pigs are devices used to clean or clear debris from the internal bore of pipelines. There are a number of names applied to “Pigs” such as:

- Swabs
- Pipe Cleaners
- Cleaning Pigs
- Poly Pigs
- Go-Devils
- Pipeline Intervention Gadget (P.I.G.)
- Intelligent Pigs (ILI's MFL's)

What is Pipeline Pigging?

Pipeline Pigging refers to the practice of using devices or implements known as "pigs" to perform various cleaning, clearing, maintenance, inspection, dimensioning, process and pipeline testing operations on new and existing pipelines. For existing operational pipelines pigging is normally performed without stopping the flow of the product in the pipeline. The “pigs” can be of differing materials and configurations such Polyurethane Open Cell Foam, Cast Polyurethane and Rubber. In pipeliner folklore it is believed that the first pipeline “pigs” used were made from leather strapping bound into a ball or sphere shape. The noise made by the “pigs” as they traversed the pipeline sounded like a pig squealing, hence the name “pigs” was adopted.

How does the Pigging process work?

By inserting the Pig into a Pig Launcher (or Launching Station) and then applying flow under pressure to the rear of the device it will move into the pipeline. The force applied by a pig as it traverses a pipeline can be calculated by multiplying the cross sectional area of the back of the pig by the pressure applied to the rear of the pig. Once a pig has launched and is moving through the pipeline the differential pressure can be calculated by subtracting the pressure in front of the pig from the pressure acting on the back of the pig. The pig speed can be calculated by tracking the pig at various points along the pipeline and calculating the time it takes to arrive at each point against the input pressure and flow rate and then converting to velocity. Generally the outside diameter of most pigs will be sized to be larger than the internal bore and the resultant ‘interference’ enables the pig to scrape and remove debris as it traverses the pipeline. The degree of effectiveness in cleaning or clearing a pipeline is determined by the type of pig employed along with other influencing factors such as flow rate, pig speed, pressure, temperature, volume of debris to be removed, length of the pipeline, number of pigging runs, number and type of bends, pipeline elevations. pigging frequency and others. When the pig reaches the other end of the pipeline it is captured in a Pig Catcher (or ‘Receiving Station’) which is isolated via a shut-off valve, allowing the pig to be safely removed.

Why is it necessary to Pig a Pipeline?

Pipelines are generally accepted as being the most efficient method of transporting liquids and gases across various distances. They represent a major financial, environmental and operational commitment by all stakeholders and in order to protect these valuable investments, ongoing maintenance must be regularly undertaken to ensure the pipeline continues to deliver optimum performance.

In the case of new pipelines once construction is complete they must be hydrostatically tested to prove they will be capable of the meeting the designated MAOP (Maximum Allowable Operating Pressure). Pipeline Pigs are used during the testing phase to fill pipelines with water and then after completion of the successful hydrostatic test to dewater the pipeline. Additionally Pigs are used to remove construction debris that may have accumulated during the construction phase of the pipeline. In some cases such as High Pressure Gas Transmission Mains, Pigs will also be used to further clean and dry the pipeline to remove residue moisture, rust, scale and debris in order to meet the minimum Dew Point as required by relevant pipeline construction codes such as AS2885.5.

Common reasons why pipelines are pigged

- Pipeline Cleaning
- Pipeline Clearing and Rehabilitation
- Proving
- Servicing
- Testing on New Pipeline Construction Projects
- Tracking
- Poor pumping efficiencies
- High Power Costs
- Pressure reduction
- Discoloration and Turbidity
- Product Contamination
- Removing debris
- Product Recovery
- Training
- Product Batching and Separation
- Internal Bore Gauging
- Pre-Inspection Survey Cleaning
- Scraping Hard Deposits
- Applying internal coatings and/or Chemical Inhibitors
- Removal of rust, scale and other internal formations
- Commissioning
- Wiping
- Hydrostatic Testing
- Filling and Dewatering
- Decommissioning
- Drying

What are Typical Pipeline Pigging applications?

Water Pipelines
Removal of Mud, Scale, Sediment, Calcium Carbonate, Manganese Iron , Bio-Films, Bacteria and other contaminants
Mining & Process Slurry Pipelines
Removal of Calcium Carbonate, Manganese Iron, Particles, Scale, Rust and other debris.
Crude Oil Pipelines
Removal of Wax, Sand, Bacterial Formations, Chemical Residues, Scale, Rust and other impurities
New Gas Transmission Pipelines
Removal of construction debris, water, rust, scale
Existing Sales Gas Pipelines
Removal iron oxides, iron sulphides and iron carbonates (known as Black Dust)
Process Pipelines
Removal of contaminants, product residues, product recovery and other impurities.

How often should I Pig my pipeline?

The Pigging frequency must be set for each specific pipeline. For instance, a water pipeline which has been in operation for some years may never have been pigged but has since accumulated a large quantity of debris which is now impacting on pumping efficiencies, water quality, power usage and the integrity of the pipeline. Further, a sales gas pipeline may normally never be pigged until it is necessary to complete a Pipeline Integrity Survey, whereas a crude oil pipeline containing significant quantities of wax, sand, bacterial formations and other debris may be pigged every day. The general advice regarding pigging frequency is that a pig is a valuable maintenance tool and a decision to pig any pipeline should be based on a thorough analysis of the line in conjunction with field-proven experience and advice offered by reputable pigging specialists.

What Pigs should I use?

The Pig selection process is often critical to achieving the desired result. Pig Types and their use are detailed on the attached PDF documents. Typical Pig types in use:

Open Cell Polyurethane Foam Pigs

- Soft Foam Proving Cleaning
- Medium Density Foam
- High Density Foam
- Polyurethane Coated Foam
- Criss Cross Polyurethane Coated Foam
- Wire Brush Foam
- Power Brush Foam
- Steel Stud Cleaning
- Plastic Stud Cleaning
- Carborundum Coated Foam
- Foam Tracking
- Double Dish Foam
- Bi-Directional Foam
- Bare Foam
- Foam Spheres
- By-Pass & Jetting Foam
- Tracking

Mechanical Pigs – Hard Cast Polyurethane, Rubber etc

- Cup
- Bi-Directional Disc
- Cup/Disc
- Scraper/Disc
- Guiding
- Wire Brush
- Magnet
- Tracking
- Scraping
- Batching and Separation
- Multi-Diameter
- Gauging
- By-Pass & Jetting
- Steel Stud Cleaning

Which Pipelines are “piggable”?

Most pipelines constructed in materials such as Steel, Stainless Steel, Duplex Stainless Steel, HDPE, DICL, Cast Iron, Plastic, PVC, AC, GRP and others can all be pigged. Additional considerations such as; number and type of bends, number and type of valves, internal diameter(s), end connections, flow rate, flow media, pressure rating, operating temperature, pipeline length, pipeline elevations, handling of flow and debris downstream and other factors. As mentioned previously, the decision to pig any pipeline should be based on a thorough analysis of the line in conjunction with field-proven experience and advice offered by a reputable pigging specialist.

HORIZON Industrial supplies a comprehensive range of Pipeline Pigs, Pig Parts, Pigging Equipment, Pigging Accessories and Pigging Services to the Manufacturing, Resource, Process and Energy Sectors. Coupled with extensive knowledge and experience backed by field-proven performance in the design, technical innovation, selection, manufacturing and application of Pipeline Pigs in Australia, New Zealand and Papua New Guinea.