What is Ice Pigging?

Ice Pigging is a highly efficient line cleaning and product recovery technique. Ice slurry is pushed through production pipelines to clean and recover product.

It differs from conventional solid pigging in that the Ice Pig is capable of navigating complex pipework which may incorporate changes in pipe diameter, bends, valve systems, heat exchangers and other obstructions with no risk of becoming stuck.

The Ice Pig is composed of fine ice crystals and a carrier fluid containing an additive used to maintain the correct fluid characteristics. In most cases the additive can be an ingredient already used in the product.

Where can it be applied?

Ice Pigging can be applied to a vast range of products within a number of industries...

- **Dairy**
- **Food & Beverage**
- **Breweries**
- **Home & Personal Care**
- **Cosmetics**
What are the benefits?

Ice Pigging is an effective cleaning process that can reduce or even eradicate the need for a chemical CIP (Clean In Place) flush.

What type of products can be removed with ice?

The Ice Pigging process is highly flexible making it suited to a diverse range of products within a number of industries such as food, beverage and personal care.

The Ice Pigging process can be optimised to efficiently recover and clean products that are normally challenging such as jam, mayonnaise and face creams.

Complex geometries...
The ice can flow through and clean diameter changes, sensors, valves, inline mixers and pumps.

Effective pipeline cleaning...
Highly effective pipeline cleaning compared to water flushing.

Increased product yield...
Ice Pigging can achieve 70-90% pure product recovery. Higher rates are possible in situations where some product dilution is acceptable.

Reduced downtime...
More effective cleaning significantly decreases cleaning time and fluid volume.

Environmentally friendly...
Efficient cleaning drastically reduces effluent volume, water consumption and energy use a result of less hot water used for CIP flushing.

TOOTHPASTE

KETCHUP

MAYONNAISE

JAM
How does it work?

1. Preparation

Once the factory’s process has completed and the line is ready for either cleaning or push out, the factory calls the AQL500 Ice Pigging machine to inject ice. The plant automatically pushes ice to the purge valve, with the injection valve closed. This removes any melt which may have occurred to ensure a sharp product interface. Once the purge volume has been delivered the plant stops and alerts the factory that ice is ready for injection.

2. Injection

Once the factory has prepared the line a start signal is sent to the AQL500 Ice Pigging machine. The machine then injects the correct volume of ice for the selected recipe. Upon completion, the factory receives a confirmation signal and can proceed to the ice propulsion stage.

3. Propulsion

The Ice Pig must then be propelled to the line end. This task is undertaken by the factory and can be achieved using several methods: water push, CIP liquid push or even using the next product.

4. Divert

To maintain the quality of the product being recovered it is important to detect the product – Ice Pig interface. Upon detection of this interface a divert valve can be activated to direct the Ice Pig to a separate collection point. Several options are available for interface detection, where possible sensors present in the system can be used. Suitable measurements include density, brix, conductivity, turbidity and temperature.
The AQL500 Ice Pigging machine

The AQL500 is a factory ready Ice Pigging machine which can be used for line cleaning and improved product recovery on process lines which are seen as un-piggable.

The purpose of the machine is to manufacture a two-phase ice slurry using potable water and a selected additive as a freezing point depressant.

The purpose of the freezing point depressant is to control the structure of the ice slurry and to prevent the ice from forming large crystal sizes. NaCl (table salt) is often used, but sugars, alcohols, acids and many other commonly found base ingredients can be used to suit the product being produced meaning the risk of product contamination is removed and very often leads to improved product recovery.

- All equipment is made from 316 grade stainless steel.
- All equipment is fully CIP’able.

The machine combines all of the following into one unit:

- Ice production
- Storage
- Maintenance
- Delivery
2 x 1.250 stainless steel bespoke Ziegra ice generators with an output of approximately 900-1400kg of high quality ice slurry every 24 hours (dependant on additive used, quality required and ambient operating conditions).

- Ice quality measurement system for consistent recipe delivery.
- Progressive cavity pump for ice delivery with line production (1.25 l/s).
- Ice separator to enable continuous ice production.
- Hygienic fully drainable design and components.
- Built in ice slurry conditioning system to maintain ice slurry and minimise the effects of ice aging.
- PLC/HMI controlled, with actuated valves for fully automatic operation.
- Built in CIP cycle (full tank flooding system / quick rinse via spray balls).
- 500 litre working volume, vertical fully agitated, insulated storage tank on load cells for accurate mass delivery.
- Machine decals, HMI screens and instruction manuals provided in English or other language as required.

A complete Ice Pigging system enclosed within steel panels.
Ice Pigging from start to finish

Initial feasibility assessment
- Customer specific paper based study of potential benefits.
- Site survey to capture physical layout of key plant infrastructure.
- Understand current line processes and cleaning methods.
- Equipment available for product/process trials.

Ice Pigging system specification
- Selection of suitable Ice Pig additive.
- Customisation of ice quality to suit product and process.
- Component specification to suit plant operating conditions.
- Determine appropriate hygiene requirements.

Installation proposals
- Detailed proposal of required equipment.
- Factory integration plan:
  - Ice Pig injection locations.
  - Process line modifications.
  - Ice Pig distribution to required lines.
  - Factory — machine communication.

Commissioning of Ice Pigging process
- Installation of ice production plant.
- Verification of machine — factory interfaces.
- Optimisation of process to achieve maximum benefit.
- Operator training.

Support
- Remote support for diagnosis and troubleshooting.
- Onsite Ice Pigging plant service support.
- Ice Pigging optimisation following factory changes.
- Expansion of Ice Pigging application.