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Cleaning of seawater intake pipelines

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ABSTRACT

The seawater inlet pipe is critical to the operation of any water treatment plant and any reduction in diameter can reduce plant efficiency and increase pumping costs. The objective of pipeline pigging is to keep the pipeline running to full capacity and avoid the build-up of mussels and other sea water/marine growth, which can cause significant and fast growing biofouling throughout water intake pipes. In order to control this potential reduction to pipeline efficiency the most environmentally friendly option is to periodically mechanically clean or scrape off, termed pigging, the organic growth and ensure a clean pipeline. The bespoke cleaning tools can be also be used to monitor and predict the potential build up and so develop an economical periodic cleaning schedule. Another option to consider may be chemical dosing, however sometimes environmental considerations prohibit chemical options. However, the organisms inhabiting the pipeline may be able to overcome such methods so perhaps a combination approach should be considered. Established in 1984 and with almost four decades of experience in pipeline cleaning and isolation, iNPIPE PRODUCTS™ have developed an integrated and systematic approach to mechanical cleaning of large diameter pipes. This includes bespoke designs and cost-effective methods to introducing the cleaning tools into the pipeline, specific designs of cleaning tools in order to systematically remove problematic organisms and deposits. Inlet spools to integrate pigging into the seawater inlet pipeline system together with outlet options for the safe and environmentally friendly removal of the debris and the cleaning tool into the sea.

Keywords: Intake pipe cleaning; Biofouling removal; Pipeline cleaning; Pipeline pigging

1. Why do we need to clean seawater intake pipelines

- The seawater inlet pipe is critical to the operation of any water treatment plant;
- Marine growth and sediment in intake pipes lead to operational problems impacting flow rate and water quality;
- Any reduction in diameter or pipe blockage will reduce plant efficiency and increase pumping costs/potential plant shutdown.

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2. Organic growth within seawater intake pipes

- Intake pipelines are subject to organic matter and organisms;
  - Micro-biological activity (bacteria, slime etc).
  - Macro-biological activity (mussels, barnacles etc).
- Biofouling or biological fouling is the accumulation of microorganisms, plants, algae or small animals where it is not wanted such as water inlets and pipework;
- Biofouling is complex and varies significantly depending on geographical location.

3. Debris transportation and distribution

- Organisms, fine sand and silts are suspended within and moved along the coast by longshore drift;
- Barnacles, mussels, oysters enter the pipeline as tiny free-swimming juveniles;
- Supplied with a constant food source and no predators, they grow and proliferate to breeding maturity within 12 months;
- Fine sand and inorganic particles can also build up rapidly in this protected environment.

4. Mechanical pipeline cleaning

- Pigging is an operation involving the running of a tool commonly known as pig/scraper through the pipeline;
- Safe proven solution to clean water pipes allowing ease of flow and transfer of clean water;
- No use of chemicals and therefore low impact on marine fauna;
- These tools can systematically remove debris, hard scale deposits/organic growths and prevent build-up.

iNPIPE PRODUCTS™ Mechanical pipeline cleaning video is available to watch - Contact us via our website www.inpipeproducts.com for further details

5. Type of cleaning tools and handling equipment

- Cleaning tools are designed and manufactured specific to pipeline specifications (foam pigs/metal bodied pigs);
- Launcher and receivers easily allow the loading and unloading of pigs into or out of a pipeline;
- Handling systems range from a simply manually operated davit and bench/trolley to fully powered, automatically operated systems.

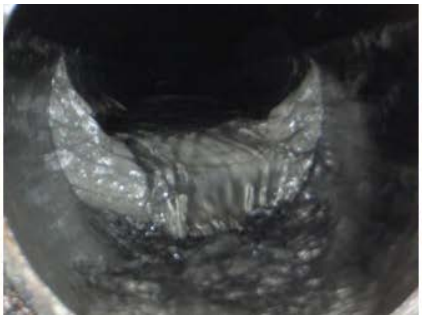


6. Pigging considerations at design stage

- Design should ensure that there is no outage during pigging operations;
- Flexible flow and pumping considerations, for example, a 1,500 mm ID pipeline requires a flow rate of approximately 9,302 m^3/h;
- Perceived deposition growth rate and threats should be investigated, for example, based on the same pipe dimension a 20 mm thickness of debris represents a 6% reduction in area and will equate to 92 m^3 of debris to be removed plus the pig;
- Safe and efficient launching facilities should include automatic pig handling and loading facilities;
- The deposition, and consequent pig design/frequency, may alter over the 50 y lifetime of the asset;
- Receiving/inlet facilities should be designed to accommodate the pig and various types and volumes of debris depending upon frequency of cleaning;
- Filtration and chemical dosing may be accommodated if required;
- Mechanical cleaning minimises environmental impact to the ecosystem.

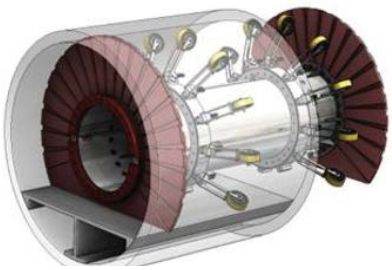
7. Pipeline cleaning regime

- Small particles of silt, sand and organic growth will enter the pipeline from the ocean suspended in the flowing sea water following the mean speed and direction of the surrounding fluid;
- Shear dispersion will move the particles to the pipe wall and debris build up will begin to occur;
- The rate of deposition will be complicated by the growth of the molluscs which can grow and breed quickly, which will rapidly reduce the effective diameter of the pipeline;
- The flow of seawater through the line keeps the bore open, albeit at a reduced diameter and increased pumping and maintenance costs.

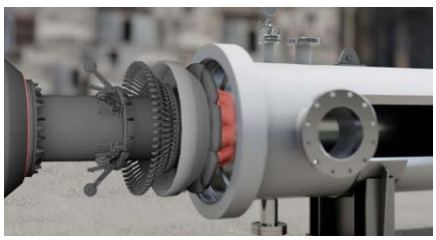
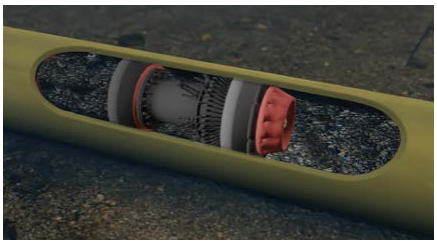
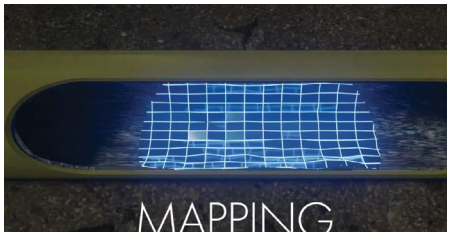

8. Pipeline cleaning regime

- The aim of the Pipeline Pigging regime is to remove the debris to provide optimum flow from the pipeline;
- Frequency of pigging runs is dependent upon the deposition rate;
- The receiving inlet spool must be designed to accommodate and allow safe debris removal;
- The pigging regime and pig design should be developed to regularly clean the pipeline and mitigate any potential for the debris removed to block the pipeline;
- Where pipelines have not been cleaned previously a "Progressive Pigging Regime" can be developed to remove the blockage bit by bit;
- A correctly installed pigging system allows for frequent pigging at minimal cost or interruption to plant operation.


9. Debris mapping tools

- Informed deposition mapping is critical to understanding deposition location together with speed of builds-up;
- Debris mapping tools are easily handled, loaded, launched and received from existing facilities;
- Robust sensor arms, odometers, gyroscopes, pressure sensors, high-definition cameras and LED lighting combine to provide detailed visual clear internal diameter, debris depth and location;
- Reports detail all debris features and full visual inspection of pipeline joints, correlated with accurate internal dimensions available post pig run.

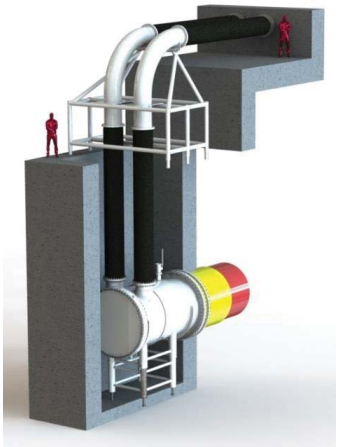
iNPIPE PRODUCTS™ Debris mapping tool video is available to watch - Contact us via our website www.inpipeproducts.com for further details

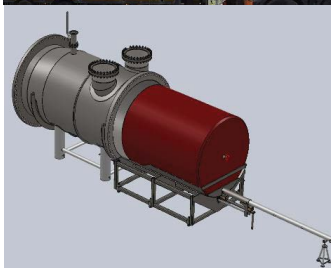
10. Project reference – 90″ Seawater intake system

Integrated seawater inlet cleaning system for a series of inlet pipelines for a facility in Algeria.


Manifold and Loader


90″ Foam Pigs


Launching trap with extendable legs



Pig on pig loader with pig being inserted into the launcher

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