Reinhart
Hydrocleaning SA

PIPELINE PRE-COMMISSIONING
STOCK OR PRE-CLEANED PIPE?

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Pipeline pre-commissioning
Stock- or pre-cleaned pipe?

Reinhart Hydrocleaning SA is the answer

INTRODUCTION

Comparison of buying stock- or pre-cleaned pipe in terms of HSE, costs and time prior to pipeline pre-commissioning

Pulling out a 12“ mechanical cleaning tool

Pipeline construction and its pre-commissioning phase is a very sensitive subject, especially when the pipeline is constructed to transport dangerous gases such as oxygen, hydrogen or nitrogen.
The following article provides information gained from experience over the last three decades spent cleaning oxygen, hydrogen and nitrogen pipelines worldwide.
The mechanical cleaning system provided by Reinhart Hydrocleaning SA (RHC SA) from Switzerland is not only the solution for the above mentioned gas pipelines. It can also be applied to the cleaning of water, industry, natural gas or oil pipelines.
One of the very first decisions one has to make prior construction is whether to buy the pipe sections in either a pre-cleaned condition or a stock condition, i.e. as manufactured from the mill. The first option would be to buy sand blasted or chemically cleaned pipelines. Those would have to be transported to site capped and nitrogen filled. The second option would be to buy stock pipe.
Despite the fact that option two is the most economic, one still has to break down the different pre-construction, construction and pre-commissioning phases to clearly define the best solution following different important aspects whilst taking into account the associated risk and time.

PRE-CLEANED PIPE

Buying pre-cleaned pipe does not eliminate the need for the pipeline to be cleaned after construction phase is finished – Why?
The very simple answer to this question is that “at all places where people work, mistakes can happen”. Besides the human factors causing problems and creating challenges on site, weather conditions can be tough as well. Someone who thinks that pipeline construction is a clean matter has never worked in the garden.

KEEP IT CLEAN

Whilst safety is paramount, costs is a factor when it comes to making decisions. Taking a closer look to the costs of pre-cleaned pipe, it is not only the cost of pre-cleaning that one has to pay. Additional costs arise directly after the pre-cleaning phase before the pipe gets on site. Each pipeline section has to be transported under nitrogen atmosphere in accordance with company and/or client policy.

Bad storage of pipelines leading to corrosion and rust

If a pipeline of 10'000 m would have to be constructed with pre-cleaned pipe sections, typically 16m long, a total of 625 sections would have to be transported capped and nitrogen filled. A total of 1'250 pipe end caps would be needed. Besides the caps and nitrogen to be used for this operation, certification and supervision of work execution has to be conducted.

CONSTRUCTION AND COMMISSIONING PHASE ON SITE

Once the pipe sections arrive on site, they have to be treated with caution when it comes to unloading and further handling on site. The pipe sections have to be correctly stored and managed in a clean and safe environment where they are protected from the elements and any potential cause of contamination.

Another sensitive phase is handling and placing the pipe sections into the pit or trench for welding during construction. Good communications between crane operators and ground crew is essential to avoid damage or contamination to the inside of the pipe section during installation.

Furthermore, the welding process itself creates clinker and metal remains.

Depending on the pit construction, weather condition and area, it can be very dirty inside and if not worked with sheet piles, pumps, gravel and wood etc., contamination of the pipe sections can occur during installation.

A properly prepared and constructed pit firstly minimises the danger for workers in the pit and secondly minimises the additional risk of pipeline pollution due to ingress of soil, sand, stones, wood pieces, plastic, etc.

Another potential issue is humidity. Due to bad handling, storage or simply poor management, moisture enters into the stored pipe sections. If not noticed, this can lead to serious defects to the inside of the pipeline.

Expecting that the pipeline handling on site is according client and/or company policy, air will naturally enter the pipeline when it comes to welding the individual pipe sections together in the pit.

Ingress of air to the pipe section during end cap removal will cause rust and corrosion.

Although it is necessary to close the pipeline at the end of the day by capping, the existing humidity in the pipeline causes corrosion and a built up of rust during the whole construction phase. Depending on the geographic location, marsh or wetlands for example, weather conditions and the risk of flooding could present a significant risk to pipeline integrity.

Having all those aspects in mind, we need to consider the constructed pipeline ready for oxygen transportation. Prior to commissioning, the line needs to be cleaned to assure that no debris remains in the line. In most cases ordinary foam, brush pigs or similar are sent through the line with compressed air. Depending on the pipeline length this may be broken down into several sections or carried out from end to end upon completion of the construction phase.

Clinker and metal remains taken out by RHC SA's mechanical cleaning tools.

The combination of sending ordinary foam or brush pigs with compressed air to remove debris is less effective compared to the mechanically cleaning method RHC SA uses. The difference between these two cleaning methods is firstly the structure of the ordinary pig compared to the mechanical cleaning tool and secondly the way it is propelled through the pipeline. Mechanical cleaning tools provided by RHC SA use water to be propelled through the pipeline. On the one hand, the speed is more controllable and debris are flushed out upfront the cleaning tool. On the other hand, the potential of a pressure built up leading to uncontrollable speed of the cleaning element in the pipeline is eliminated. Cleaning tools provided by RHC SA work with an integrated bypass adapted to pipelines condition allowing the tool to clean in dynamically rather than in a static way when compared with ordinary foam or brush pigs.

In most cases, once the construction phase is finished, the pipeline needs to be pressure tested. As the pipeline was bought pre-cleaned, the usage of water for the strength test would not be acceptable. Alternatively, the pipeline would have to be pressurized with compressed air (filtered and dried) or with the gas to be transported in the future. Comparing the risks of executing a strength test with water to gas, the danger of a pressurized gas such as compressed air, hydrogen,

nitrogen or oxygen is much higher than with water. In the event of a failure resulting in a break of containment, the consequences of using a gas compared to a liquid test medium would have a massive impact on people and the environment.

STOCK PIPE

Buying stock pipe is a very simple, predictable and calculated process. The amount of pipe sections needed for the project have to be ordered and brought to site. The requirement for sand blasting or nitrogen filling etc. are no longer needed resulting in a significant cost saving.
This is also a typical scenario when it comes to the construction of natural gas and oil pipelines.

HSE AND CONSTRUCTION

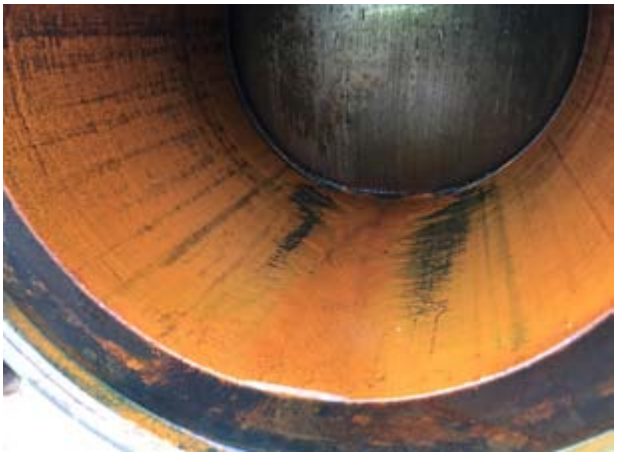
When using stock pipe sections, the priority and importance of cleanliness on site moves downwards. All costs related to cleanliness on site regarding the pipeline storage, further handling and supervision are therefore no longer needed. The attention can be paid more to HSE and construction itself.
Although the pipeline is in a stock condition, the pipeline contractor shall work in accordance with company and/or client documentation when it comes to the construction phase. The debris that results from the welding process is unavoidable – attention to this issue can be paid after construction phase is finished.
Despite the fact that the pit should be created with sheet piles, pumps, gravel and wood etc. as a matter of course for safety reasons, it is less of a consideration for the cleanliness of the pipeline.
Attention to the removal of potential debris such as soil, sand, stones, wood pieces, plastic, etc. which could remain after construction inside the pipeline can be given after the construction phase is finished.

A well prepared pit

Pulling out a 6“ mechanical cleaning tool

Furthermore, and this is another very important factor of the construction phase, is the remaining humidity in the pipeline causing rust- and corrosion built up.
The built up of rust inside the pipeline, especially in the pores, pits and surface defects, can also be taken into consideration after the construction phase.
Having considered all these aspects, we now look again at the newly constructed pipeline ready for oxygen transportation. In this case, the potential for contamination and debris build up inside the pipeline is of course higher than after the construction of pre-cleaned pipe sections.
How does this pipeline then get to the stage of cleanliness required for the safe transportation of oxygen or other pure gas?

The answer to this is REINHART HYDROCLEANING SA – the mechanical cleaning tools, specially designed and manufactured to meet the pipeline requirements, effectively and safely clean the pipeline ready for oxygen transportation. With experience gained since 1952, RHC SA provides innovative, tailored cleaning solutions to a wide range of clients across the global industry, water, oil and gas sector.
The mechanical cleaning tools designed and manufactured by RHC SA are propelled with water once the construction phase is finished and the gas pipeline needs to be cleaned. The cleaning tool can be used during the flooding and filling stage to evacuate air prior to hydro-testing, minimising the number the of



Rust build up after 24 hr.

cleaning runs required.
The execution of a strength test with water compared to gas has less risk for people and environment when it comes to a break of containment or similar problem during the test.
Following RHC SA's procedure in cleaning gas pipelines, the pipeline gets mechanically cleaned, pressure tested, dewatered and dried to a dew point of -65°C.
Once the drying process is finished, further tests such as white towel swipe test, UV light test or endoscopy is performed to verify pipeline's cleanliness.

During verification of pipeline's cleanliness, one will recognize that the pipeline surface is polished and absolutely smooth. Compared to a sand blasted pipeline, which has a clean but rough surface, the smooth surface after the mechanical cleaning with RHC SA creates less turbulences of the gas during service.

From our experience the use of stock pipe instead of pre-cleaned pipe for oxygen, hydrogen or nitrogen reduces time and cost in the following areas:

- Avoidance of additional costs in terms of certification, waste management, capping and nitrogen filling during transportation and storage of pre-cleaned pipe sections
- The supervision, reporting of cleanliness on site and the importance of cleanliness during construction phase
- Controlled and well managed mechanical cleaning to the necessary level required by the client – typically cleaning the pipeline to bare smooth metal finish and eliminating the risk of having any potential debris in the line
- No additional third party costs due to rental or other sub contractors as RHC SA can provide the full equipment scope to perform the pipeline cleaning
- The RHC SA cleaning tool will effectively evacuate air when used to cleaning the pipeline. The hydro test will be executed in a controlled and safe manner without any time loss during pressurization
- The use of RHC SA cleaning tools, designed and manufactured to meet pipeline and operator requirements, result in long term working relationships providing continued support and management to maintain the pipelines cleanliness during its operational life.

A 10" pipeline, 30 km long,
after execution of a RHC SA procedure.

Besides the scope of cleaning pipelines having to transport gases mentioned in this article, the mechanical cleaning method of RHC SA could also be of interest when it comes to cleaning natural gas pipelines prior commissioning.

In the end it is:

"not the number,
but the quality of cleaning runs"

that is important and of course cost saving.

If you need advice buying either stock or pre-cleaned pipe sections, have questions about cleaning crude oil, natural gas or pipelines with hard deposit, should you require any additional information or have a specific cleaning application that you would like to discuss in more detail then do not hesitate to contact us.

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Thinking out of the box
...still not in it!

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