



NET4GAS, s.r.o

HP PIPELINE DN1400, NODE KATEŘINSKÝ POTOK - NODE PŘIMDA

Cleaning, Calibration and First Run - Specification

23.10.2018

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1 INTRODUCTION

1.1 Scope of the Document

This specification contains Employer's requirements for the cleaning, calibration and first run of the piping within the construction project of the "HP Pipeline DN1400, Node Kateřinský Potok - Node Přimda".

The specification includes requirements for:

- Gas pipeline cleaning
- Drainage and drying
- Internal inspection

The following standards shall be followed during the above stated activities:

- ČSN EN 1594 Gas supply systems - Pipelines for maximum operating pressure over 16 bar - Functional requirements
- TPG 702 04 Steel gas pipelines and connections with the maximum operating pressure up to 100 bar inclusive
- TPG 702 11 Cleaning and drying pipelines of all pressure levels after the construction
- TP T01 01 01 03 Principles for design, construction and repair of HP gas pipelines and connections up to 100 bar
- ČUBP Regulation No. 85/78 Coll., on inspections, revisions and tests of gas equipment
- VdTÜV-Merkblatt 1051
- VdTÜV-Merkblatt 1060

It applies in general, that all works shall be completed and shall follow the applicable standards and regulations as amended and valid at the starting date of the work.

The Supplier shall present to the Employer the detail work schedule and procedures for the cleaning, drying, calibration (gauging) and internal inspection no later than 60 days before start of the works.

All instrumentation used for pressure, temperature and flow rate measurement shall have a calibration certificate valid at least two months before starting the work; the certificate shall remain valid for the entire period of the work execution.

1.2 Definitions

Term	Explanation
Project	High Pressure Pipeline DN 1400, Node Kateřinsky Potok- Node Primda
Employer	NET4GAS
Consultant	ILF Consulting Engineers
Supplier	Means responsible Contractor regarding engineering and supplying of total scope as outlined within this specification

1.3 Abbreviations

For the purposes of this specification, the following abbreviations shall apply:

Zkratka	Význam
ČSN	Czech Standards Institute
DN	Diameter Nominal
EN	European standards
BTS	Border Transfer Station
HSK	Hora Svaté Kateřiny
ISO	International Organization for Standardization
MOP	Max. Operating pressure
TPG	Technical regulations - Gas

1.4 References

No.	Number	Title
1	C4G-HPPL-ILF-GENER-STR-SPC-813	Line Pipes DN1400 - Specification
2	C4G-HPPL-ILF-GENER-LIN-SPC-805	Construction Specification

3	C4G-HPPL-ILF-GENER-LIN-SPC-803	Pressure Tests and Stresstests - Specification
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1.5 Codes and Standards

1.5.1 International Codes and Standards

No.	Number	Title
1	ČSN EN ISO 3183	Petroleum and natural gas industries -- Steel pipe for pipeline transportation systems
2	ČSN EN 1594	Gas supply systems - Pipelines for maximum operating pressure over 16 bar - Functional requirements
3	ČSN EN 13480-5	Metallic industrial piping - Inspection and testing
4	ČSN EN 12327	Gas infrastructure - Pressure testing, commissioning and decommissioning procedures - Functional requirements
5	API 6D	Specification for Pipeline Valves

1.5.2 Technical rules and technical instructions

Č.	Číslo	Název
1	TPG 702 04	Gas mains and service pipelines of steel for maximum operating pressure up to 100 bar included
2	TPG 702 11	Cleaning and drying pipelines of all pressure levels after the construction
3	TPG 923 01	Certification of processes – Testing the professional level and working qualities in the field of gas installations
4	TP T01 01 01 03	Principles for design, construction and repair of HP gas pipelines and connections up to 100 bar

1.6 Priority, exceptions

Before starting the work (i.e. submission of the schedule and procedures - see article 1), the Supplier shall notify the Employer / Employer's supervisor / a third party of any conflicts between this specification, related documents, codes, standards, and technical regulations as outlined above, and any other specification that is part of the tender. In such a case, the Employer / Employer's supervisor / a third party shall provide a written precedent and / or interpretation within the approval of the procedures. Compliance with the requirements contained herein shall not exempt the Supplier from its liability or other contractual obligations to perform its duties.

2 PIPELINE GENERAL REQUIREMENTS

2.1 Construction

The requirements described below shall be strictly followed in order to provide for cleaning and inspection of the gas pipeline.

The entire pipeline section shall be constructed in a single size of pipe in order to facilitate the line cleaning. All valves on the main line shall be of full-bore type, the radius of any bends on the line shall be at least $R_{min} \geq 10D$ and ovality up to 2.5%; use of any smaller radius shall be consulted with the gas pipeline operator.

Bars shall be installed at all gas pipeline branches ($d/D \geq 0.25$). The branches shall be connected to the gas pipeline in the upper part of the pipe ($\pm 45^\circ$ from the vertical plane). No installations shall be made within the gas pipeline that would interfere with its profile making the pig passage impossible (e.g. thermometer wells, flow rate gauge, sampling systems etc.).

The minimum internal diameter of all gas pipeline components (internal diameter and ovality parameters), in particular of any bends, T-pieces and line valve stations shall guarantee smooth inspection. The minimum guaranteed internal diameter values of the piping shall not drop under the value of the ball valve bore internal diameter; see the Table according to API 6D.

The pig signaller installation shall include a manual pig signalling.

Dimensions of the scraper launcher and receiver traps shall be universal for bidirectional cleaning of the gas pipeline and for various Suppliers of the in-line inspection, tools and services.

The maximum scraper trap axis height shall be 1.8 m above the final ground level at the terminal objects of the gas pipeline; there shall be a starting and pressurizing (venting) lines for equal pressurizing of the trap upstream and downstream the pig. The layout of the launcher and receiver facilities shall enable handling of equipment used for the in-line inspection (crane + truck just by the scraper trap).

2.2 After the construction

Each gas pipeline section shall be cleaned with pressurized air driven pigs following the completion of the individual sections. The pig cleaning is based on the pig passage through the piping; the pig pushes out any contamination from the piping. Pipeline cleaning, together with the gauging (calibration), shall take place before the pressure tests in individual sections, taking into account local conditions and prescribed occupational health and safety measures. Passage of the gauging plate proves passability of the piping for the inspection tools. The calibration plate shall be fitted with a device to locate it in the event of its sizing in the pipeline. The construction quality and conformity with the required geometric parameters shall be verified by the geometry inspection - a geometric pig (a precise method using an electronic measurement pig). The geometry inspection shall be done within the calibration.

After the cleaning of the individual sections and the preliminary gauging, the pressure tests of the gas pipeline shall be carried out including the stress test. The pressure test and stress test are described in the specification C4G-HPPL-ILF-GENER-LIN-SPC-803 Pressure Tests and Stresstests - Specification.

The piping shall be drained and dried after the pressure test. Water shall be safely drained from the piping at an appropriate drainage point or drained to the next piping section; consequently, the piping shall be dried. The drainage points are listed in the document C4G-HPPL-ILF-GENER-LIN-SPC-803. The piping cleanness shall be checked during water drainage and drying. After the tests, calibration and geometry inspection shall be performed again.

The operator shall make the first in-line inspection of the piping using the "intelligent pig" after filling the gas pipeline with gas.

3 GAS PIPELINE CLEANING

3.1 Cleaning procedure

Prior to the start of the pressure tests and stress tests, individual sections of the pipeline shall be cleaned. The cleaning and preliminary calibration shall be carried out in conformity to TPG 702 11 in all sections where purity and passability of the piping cannot be checked visually (short sections). The cleaned section shall be the same as the

section to be stress tested. The section shall be completed and covered. The gas pipeline bedding and padding and the ditch backfilling shall be made according to TPG 702 04, Art. 6 and TP_T01_01_01_03, Art. D.4.1. The bedding and padding shall be made of appropriate material free of sharp aggregates. The backfilling procedure is described in C4G-HPPL-ILF-GENER-LIN-SPC-805 Construction Specification. Only the ends of the sections within the length of up to 30 m can remain non-covered; in the case of requirements for installation of temporary scraper traps and bends for connection the non-backfilled ends can be of longer length - such requirements shall be described in the work procedures and approved by the Employer, Employer's supervisor or a third party before starting the backfilling works. Excavations at the section ends shall be made in conformity with the applicable standards and enable installation of the temporary scraper traps as well as safe access for the operators. No line valve stations shall form part of the sections. The temporary scraper traps shall enable controlled arrival of the pig; the traps shall be welded to the piping.

The piping shall be cleaned with a compact cleaning pig with caps or discs and magnets; it shall be repeated until the required cleanness will be achieved (the piping free of mechanical contamination). A section shall be considered cleaned if the amount of removed contamination and water will not exceed 30 l and rough dirt will not exceed 25 mm. Before cleaning, the senior technician of the cleaning shall invite the Employer, Employer's supervisor / third party to check the cleaning and to assess the result. The Employer, Employer's supervisor / third party has the authority to decide on the cleaning condition and to order other runs of the cleaning pigs through the pipeline. Discs shall be used for pigs that travel in the piping in both directions and are of flat annular ring shape. Caps shall be used for pigs that move in one direction only inside the piping and that are dish-shaped with the wider end facing the back side. If gauging with a gauging pig is used, the cleaning shall be executed with two cleaning pigs, at least. If a gauging plate is used for the gauging, the plate can be fitted to the second cleaning pig.

Before the gauging, the lead gauging technician shall invite the Employer, Employer's supervisor /third party for inspection of the gauging plate and evaluation of the gauging result.

After the passage of the gauging plate the lead gauging technician shall elaborate the piping gauging (calibration) report describing the gauging plate condition, including photos.

The construction quality and conformity with the required geometric parameters shall be verified by the geometry inspection – a geometric pig.

The cleaning, gauging and geometry inspection process shall be repeated after completion of the stress tests, pressure tests and connection of the individual piping sections.

The air pressure driving the pig in the piping shall not exceed 6 bar during the cleaning. The compressor power shall be applied so as the cleaning pig speed will range between 1-3 m/s.

3.2 Machinery and equipment

The following machinery and equipment shall be used for cleaning and gauging:

- cranes
- excavators
- trucks, containers
- mobile generators
- oil-free compressors
- air driers
- pumps including accessories for ditch drainage
- launcher and receiver scraper traps including accessories

3.3 Tools

The following tools and equipment shall be used for cleaning and gauging:

- cleaning pigs
- gauging plate with locator
- geometric pig with recording equipment and locator
- intelligent pig (first in-line inspection)
- manual and automatic welding machines with accessories
- grinders, cleaning brushes etc.
- manometers
- shovels, spades, hacks etc.
- bars, auxiliary padding materials, gauge tapes etc.
- wireless communication devices

3.4 Determination of gauging plate dimensions

The gauging plate diameter for the gas pipeline should be as follows:

$$D_{kd} = 0,98 \cdot D_{i\min} - 10mm$$

Where:

D_{kd} - is the gauging plate diameter [mm]

$D_{i\min}$ - is the minimum internal diameter in the cleaned section, ovality including the wall thickness tolerance is not taken into account [mm]

The gauging plate shall be made of a material that provides adequate strength but can be deformed, e.g. 5 mm thick Aluminium sheet; it shall be divided into individual segments by 20° around the perimeter.

4 SAFETY AND ENVIRONMENTAL PROTECTION

The requirements for the safety during the construction, testing and inspections after completion of the tests in conformity with the standards and documents referred to in Chapter 1 hereof and this specification, as well as any future technical and organizational documents developed by the expert work Supplier and subject to the Employer's approval, shall be considered during the entire period of the gas pipeline work execution.

The Supplier shall notify the local authorities in writing on the testing schedule and organization before the gas pipeline pressure tests on the basis of the documentation approved by the Employer and according to the project technical and organizational documentation.

The Supplier shall ensure safety of the operators, the population and their assets as well as protection of the machinery and equipment along the pipeline within the tested section.

The testing personnel shall be briefed on the applicable safety rules and provably trained.

5 GAS PIPELINE DRAINAGE AND DRYING

5.1 Drainage and drying procedure

The process of draining the individual pipeline sections can begin after successful strength tests, leakage tests and stress tests. Remote controlled valves shall be used for de-pressurization of the piping. The pipeline shall be drained using pigs, such as foamed polyurethane cylinders. The pigs shall be driven from the launching end towards the receiving end. The compressed air is used to drive the drainage pigs. A sufficient quantity and pressure of air shall be ensured for the drive and the drainage pig feed rate

should not be higher than 2 km/h. The final rate of the pipeline draining shall be adapted to the technical possibilities of a particular drained section of the pipeline (pumping to the next section, discharging to a catch basin, watercourses).

Prior to drainage, the Supplier shall submit a detailed procedure to the Employer for approval. During all drainage operations, the Supplier shall make the necessary arrangements for the drained water to be suitably disposed of, in order to avoid pollution, damage to crops, to existing works, obstructions to traffic and to comply with agreements and approved procedure. The purified water can be pumped back into the watercourses that will be defined in the approved procedure. The Supplier shall comply with the requirements of the water authorities when discharging water. These provisions shall be taken into account by the Supplier during the planning stage of the strength tests, leakage tests and stress tests.

5.2 Waste water treatment method

Water from the drained pipeline sections shall be pumped to the next piping section for the purpose of the leakage test, strength test and stress test. Water from the terminal section of the pipeline shall be drained to an approved watercourse while respecting the defined measures and requirements of the water management authorities according to the respective permissions. Water from the drained piping sections shall be free of biological contamination and of the same chemical parameters as water used for filling; water may contain trace amounts of floating contamination or easy sedimentation compounds such as sand, mud, metal particles, coating material particles or traces of grease, oil etc. Water quality and potential contamination shall be monitored during water pumping and drainage. Before discharging water to a watercourse, it is recommended to pump it to a separator (sedimentation tank) for detection of any potential contamination. Filter will be used for water discharging to eliminate the contamination. Water from the sedimentation tank shall be drained by pumps with hoses freely placed on the ground. Truck tanks shall be used in case of water transport to a greater distance. Water shall be discharged to a watercourse in accordance with instructions of the watercourse administrator and provisions included in the applicable permissions. It is recommended to adjust the discharging spot and protect the banks and the bed against damage, e.g. by installation of panels, concrete slabs or grassing panels. The amount of discharged water shall be adequate to the technical capacity of the watercourse. Discharge water shall not damage, undermine the bed and banks and cause any flooding in downstream areas.

5.3 Drying procedure

The pipeline drying process can begin as soon as the individual pipe sections have been drained. The drying process can be carried out in the sections designed for pressure

tests and stress tests, or after connecting the test sections to longer units after the end of the pressure tests. However, the length of the joint sections shall not exceed 50 km.

The purpose of the drying is to remove all water that is bound to the pipe wall by capillary forces or may be in the pipeline loosely at its bottom. The pipeline shall be dried in accordance with TPG 702 11.

The cleaning pig shall be used as a tool for pipeline cleaning and to expel any residual water from the pipeline during the drying process; the pig removes solid and liquid contamination and partly also loose water. Furthermore, a foam pig shall be used to spread water on the internal surface of the piping and expel it out of the piping partly. Pressurized air is used as the driver.

For drying, similar equipment and conditions shall be used as for cleaning; the use of already installed permanent launchers and receivers is not excluded. Drying is expected to be done with extremely dry air (water dew point below -60°C). The power of the compressor and dryer installed between the compressor and the scraper trap shall match the pipe dimension. Drying shall start by the run of the foam pigs; their number shall be adequate to the section length. The water dew point shall be measured at the piping outlet. Additional spreading foam pigs can be used in case of an unfavourable development. It is recommended to complete drying without stopping the operation. After stabilization of the final dew point temperature (-20°C) the drying process shall be interrupted for about 120 min; the gauging pig shall be inserted into the pipeline for the final gauging that, among other things, will verify that no undesirable deformation occurred during the pressure tests and joining of pipes. The final gauging and geometry inspection shall be provided within the entire section that allows cleaning according to par. 7.1. The drying shall be proven by constant monitoring of the dew point during the calibration process; the dew point shall not exceed the defined value (-20°C). A reduced value indicates local puddles and drying shall continue.

5.4 Machinery and equipment

The following machinery shall be used for the draining and drying:

- cranes
- excavators
- trucks, containers
- tanks
- mobile generators
- oil-free pump
- oil-free blower

- air driers
- water pumps, including hoses and accessories
- pumps for ditch drainage including accessories
- temporary launcher and receiver scraper traps including accessories
- separator / sedimentation tank (mobile or temporary)
- filters
- catch tanks for water including fittings (mobile or temporary)

5.5 Tools

The following tools and equipment shall be used for drainage and drying:

- draining, cleaning and drying pigs
- manual and automatic welding machines with accessories
- grinders, cleaning brushes etc.
- precise manometers
- recording manometers
- flow meters
- thermometers
- hygrometers
- shovels, spades, hacks etc.
- bars, auxiliary padding materials, gauge tapes etc.
- wireless communication devices
- SW, HW, evaluation devices

5.6 Parameter checking method

It is recommended to monitor the piping drainage rate using an indicative flow meter. Speed of the drainage pig and the drainage rate can be controlled according to the amount of water discharged from the piping. The amount of water expelled from the piping can be compared with the amount of water pumped into the piping before stress / pressure test. This will allow checking the drainage quality and making a decision whether the residual water in the piping should be removed by a repeated run of the pig.

Pig runs during water expelling and drying serve also for cleaning and control of cleanness of the pipeline.

The purpose of the drying is to achieve the water dew point of -20°C in the air present inside the piping, or a value defined by the Employer. The drying process includes expelling of residual water and wiping by foam pigs.

The hygrometer probe shall be placed to the air draft flowing out of the piping so that the value measured shall not be affected by air outside the piping. The dew point shall be measured during the air flow. The preliminary values measured shall be recorded to a report by the technician in charge.

The dew point shall be constantly monitored during the drying process; the dew point shall not exceed the defined value (-20°C). A reduced value indicates local puddles and drying shall continue.

Drying shall be terminated if all of the following conditions occur at the same time:

- the dew point at the dried pipeline outlet is -20°C or lower;
- all pigs inserted in the piping arrived to the receiver scraper trap;

A verification measurement shall be made when the required dew point is achieved; this is to prove the pipeline drying to the required level.

After stabilization of the final temperature (-20°C) the drying process shall be interrupted for about 120 min; the calibration pig shall be inserted for the final calibration that, among other things, shall verify that no undesirable deformation occurred during the pressure tests and joining. The drying shall be proven by constant monitoring of the dew point during the gauging process; the dew point shall not exceed the defined value (-20°C). A reduced value indicates local puddles and drying shall continue. If the pipeline is being dried including the object, drying of the by-passes shall be allowed by operating the relevant valves.

Records from the verification measurement shall be made at regular intervals after one tenth of the delay time. The lead technician shall record the dew point value measured in the report.

If, within the verification period, the dew point value increases above the required value, drying shall continue and the verification measurement shall be repeated when the prescribed dew point will be achieved.

The pipeline shall be considered dried if the dew point value will not increase above the required value. The dew point values measured during the verification measurement shall be recorded to the pipeline drying report by the lead technician.

6 STATION PIPING DRAINAGE AND DRYING

6.1 Drainage and drying procedure

The process of draining the individual sections of station piping can begin after successful strength and leakage tests. Remote controlled valves shall be used for depressurization of the piping. The final rate of the draining shall be adapted to the technical possibilities of a particular drained section (pumping to the next section, discharging to a catch basin, watercourses).

Prior to drainage, the Supplier shall submit a detailed procedure to the Employer for approval. During all drainage operations, the Supplier shall make the necessary arrangements for the drained water to be suitably disposed of, in order to avoid pollution, damage to crops, to existing works, obstructions to traffic and to comply with agreements and approved procedure. The purified water can be pumped back into the watercourses that will be defined in the approved procedure. The Supplier shall comply with the requirements of the water authorities when discharging water. These provisions shall be taken into account by the Supplier during the planning stage of the leakage and strength tests.

Discharge of water from tested station piping shall be conducted using a high-pressure hose via the emptying kit attached to the temporary purging assembly on pipe branch. Water shall be removed from the piping after execution of strength and leakage tests and the piping shall be dried out according to a detailed procedure approved by the employer and prepared in compliance with TPG 702 11.

6.2 Waste water treatment method

The same waste water treatment method shall be used as for Gas Pipeline Sections. The method is described in the Chapter 5.2.

6.3 Drying procedure

Piping drying shall be carried out by blowing-through with highly dry air from the drying unit to reach the value corresponding to the value of the dew point of the piping internal space -20°C.

Drying Unit is a special apparatus that dries the air to very low humidity corresponding to the dew point by way of absorption. Blowing-through of the piping with this highly dried air will remove moisture from inner walls of the dried piping to the required value.

The air source shall be the compressor connected through a set of filters and separators to the drying unit. In the unit the air shall be dried out and then blown through a bypass fitting to the piping system.

Each individual blown section shall be connected to the drying unit through a flange DN 50 / 600 # RF (within pressure sections these are points intended for connection of the compressor for water displacement after the pressure test or for piping draining).

Blowing-through shall be carried out by opening of the bypass fitting to the whole cross section and is performed repeatedly if required, always at least 5 min, depending on the length of the blown section.

During the blowing-through the air shall be ventilated through gradually opened air-relief and water-drain valves and so on.

During the drying, any manipulation with equipment within the dried piping system is forbidden, except manipulations with fittings required for blowing-through the air.

Blowing-through shall proceed gradually in the direction from the drying air source and main piping system branches; Until main routes, branch lines, bypasses, etc. are dried.

In the case the dried piping section contains fittings or other equipment where water can accumulate, the equipment shall be drained off during drying and dewatered using compressed air.

During the blowing-through, outlet areas together with possible danger area shall be visually controlled.

During the drying, air humidity shall be measured on individual outlets using a measuring device. When the required humidity (on all measured outlets) corresponding to the dew point -20° C is reached, the drying shall be finished.

After drying termination, required modifications of individual piping sections shall be made to restore them to the operating condition, and the piping sections shall be closed in the appropriate manner (heads, blind flanges, etc.) to prevent humidity penetration from the outside environment. In places of the boundary between individual dried sections, final modifications shall be made after drying out of both sections.

6.4 Machinery and equipment

The same machinery and equipment as described in Chapter 5 shall be used for drainage and draining of station piping (excluding temporary scraper units).

6.5 Tools

The same tools as described in Chapter 5 shall be used for drainage and draining of station piping (excluding draining, cleaning and drying pigs).

6.6 Parameter checking method

The purpose of the drying is to achieve the water dew point of -20°C in the air present inside the piping, or a value defined by the Employer. The drying process includes expelling of residual water.

The hygrometer probe shall be placed to the air draft flowing out of the piping so that the value measured shall not be affected by air outside the piping. The dew point shall be measured during the air flow. The preliminary values measured shall be recorded to a report by the technician in charge.

The dew point shall be constantly monitored during the drying process; the dew point shall not exceed the defined value (-20°C). A reduced value indicates local puddles and drying shall continue.

Drying shall be terminated when the dew point at the dried piping outlet is -20°C or lower.

7 GAUGING AND GEOMETRY INSPECTION

7.1 Gauging and geometry inspection procedure

The Supplier shall perform the final gauging and geometry inspection. Free passage through the pipeline shall be proven by a gauging plate. Observance of quality in construction and required geometric parameters shall be checked by subsequent geometry inspection. The gauging plate shall be fitted with a device to locate it in the event of its jam in the pipeline. The gauging plate shall be installed between the rear sealing discs of the pig, provided there is sufficient disk spacing to allow for possible deformation of the plate but will not cause it, or the gauging plate can be fitted before the rear seal assembly where it is not in contact with the deformed sealing disc. The geometry inspection shall be made with a geometry pig with a recorder and locator. It is recommended that the final gauging and geometry inspection be carried out on a completely assembled pipeline, including a tightly installed launcher and receiver stations so that the gauging covers the whole pipe section, including all valves. The pig position shall be constantly monitored during the gauging and geometry inspection process using the pig signaller at stations and a mobile service provided by the Supplier. The pig position monitoring also provides the final confirmation on its passage through the given section and on the geometric survey. The gauging shall be considered completed if the gauging plate will smoothly pass through the tested section and the measured internal dimensions of the piping will be within the permitted limits. If any contamination will be expelled by the gauging plate from the piping, cleaning by the cleaning pigs shall be repeated as well as the gauging. The final gauging and geometry inspection evaluation shall be provided by an experienced person authorized to decide on the further steps.

The Employer / Employer's supervisor, third party shall be invited to witness the evaluation.

The purpose of the gauging is to identify whether the pipeline allows passage by standard cleaning and electronic inspection pigs, whether no components with a non-standard internal diameter or ovality are installed in the pipeline.

The purpose of the geometry inspection is to make sure there are no local imperfections in the piping, particularly any bumps caused by failure to follow the technological procedure during handling and installation; furthermore, the purpose is to verify the quality of construction, conformity with the required geometry parameters and lack of any parts with non-standard internal diameter or ovality. The geometry pig shall provide precise information on the type and location of imperfections.

7.2 Geometry inspection specification

See Chapter 3.4 for the gauging plate for the pipeline; the diameter calculation can be used also for the geometry pig run.

The minimum internal diameter of all gas pipeline components (internal diameter and ovality parameters) shall guarantee smooth inspection, particularly any bends, T-pieces and live valve stations. The minimum guaranteed internal diameter values of the piping shall not drop under the value of the ball valve bore internal diameter; see the Table according to API 6D.

7.3 Geometry inspection result evaluation method

The results of the final geometry inspection of the pipeline shall be compared against values specified in the documentation for the permissible deviations of the ovality; it should be identified, whether the piping is free of local imperfections; the minimum internal diameter within the tested piping section shall be identified.

7.4 Measures to be applied after the geometry inspection result analysis

If the final geometry inspection results will not be within the tolerance, the Employer shall decide either on acceptance of the situation or on implementation of any particular corrective actions. The recovery plan may include replacement of a defective part of the piping, a bend or fitting with a defect identified.

Following the positive analysis of the piping inspection results the piping shall be approved as capable of inspection and the report shall include the parameters of the tested piping section, such as the length between the launcher and receiver, minimum internal diameter etc.

8 BASE LINE SURVEY

8.1 Base line survey result analysis

The operator shall make the base line survey of the piping after filling with gas using the intelligent pig that is capable of recording any irregularities in the piping, measurement of the geometry, precise location of the imperfection and identification of imperfection type. The results shall be further analysed, evaluated and displayed in 3D presentation.

The analysis and evaluation of the results of the first in-line inspection (base line survey) shall be made by the Supplier and the results shall be provided to the Employer for approval; any irregularities and deficiencies shall be notified to the Employer by the Supplier. The purpose of this inspection is to confirm safe use of the pipeline. The base line survey results shall be saved as a model and used in the future as the source material for comparing the results of future tests for identification of the piping wear level. One pig run is expected within the base line survey. If an extensive damage will be identified and a mechanical intervention to the piping will be required during repair of damaged parts, or if the base line survey results and analysis will not be clear, a repeated intelligent pig run may be required.

8.2 Construction quality check

The results of the first in-line inspection shall be used to check the quality of the gas pipeline construction. All deficient or damaged parts shall be identified and monitored by the Employer.

8.3 Deficiencies identified

The complaint process can be initiated in the case of any deficiencies identified based on the inspection results. The location shall be identified for the deficiencies as well as the irregularity with the hazard information for the gas pipeline operation.

8.4 Measures based on the base line survey

Corrective actions shall be implemented depending on the scope of deficiencies, damage, defect or other findings; alternatively, any acceptable low-level deficiencies can be left as they are without a correction.

Corrective actions may include for example:

- local repair of damaged coating
- damaged coating substitution with an active cathodic protection on the piping

- replacement or repair of damaged surfaces in case of mechanical damage of pipes or defective welds

9 SUMMARY

All information collected on the gas pipeline inspections shall be recorded in the database. The data shall contain all identifiable data related to the installed technology; the database shall be sorted in ascending order from the gas pipeline start in the (prevailing) gas flow direction; the smallest construction element shall be a pipe or an installation.

The inspection Supplier shall elaborate the longitudinal profile and layout documentation in equal scale that will allow matching to each other.

All documentation shall be delivered

- a) in digital format, two copies
 - in editable format (Word, Excel, dwg...)
 - in fixed format (PDF...)
- b) 4 printed copies in legally acceptable form
- c) If special software is used for the evaluation and viewing, such software shall form part of the delivered documentation, including the license. The software can be used without any additional costs.