Joint Stock Company
Caspian Pipeline Consortium-R

Endorse

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MR Region Manager

_____2020

Approve

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Service Task Order

CPC-R MT submarine lines smart pigging

Novorossiysk 2020

1. Abbrebiations

CPC-R - Caspian Pipeline Consortium R
MT - Marine Terminal
TF - Tank Farm
SF - Shore Facility
OCC – Operations Control Center;
SBS - Smal Boat Shelter
SMP - submarine pipeline
SPM - Single Point Mooring
PLEM - pipeline end manifold
SM - smart pigging
SM - smart pig
PLR - pig launcher receiver

NDT - Non-destructive test
ISE - industrial safety expertise
VHF - very high frequencies
RTN - Rostekhnadzor
RRS - Russia Register of Shipping
HSE - Health, Safety and Environment Protection
IMCA - International Marine Contractors Association, its rules and standards for diving operations
OCIMF - Oil Companies International Maritime Forum

2. Objectives and Tasks

Smart pigging is troubleshooting, registration of any anomalies and establishing the condition and prospects for further operation of the SMP and PLR under the design modes.

3. MT SMP description

MT lies in the vicinity of Novorossiysk, Russia Krasnodar Krai, about 9 miles westward of the entry to the Black Sea Novorossiysk Bay. MT exports crude oil to the international market from the fields in Kazakhstan and Russia.

MT includes:

- TF: a process site accommodating 10 tanks total volume 1 000 000 m.cu. With auxiliary equipment. TF is 9 kilometres inshore at an elevation of 251.8 metres. TF serves continuous transport of oil via the Tenguiz-Novorossiysk PL.
- 9.3 kilometre long crude oil process line dia 1422 mm (56'') connects TF to SF.

- SF is an oil lifting site right on the shoreline. SF accommodates admin buildings, OCC, pressure reduction station, LACT, PLR, MPT and other equipment for transporting oil from the SF to SPM;
- MT Hydrotechnical Facilities.
  There are three SPM's
  that lie about 6 kilometres offshore and moor and load tankers;
  SMP - there are three dia 1067 mm (42'') submarine pipelines
  each about 6 kilometres long lying on the seabed,
  and connecting SF process lines to SPM CPC-1, SPM CPC-2 and SPM CPC-3;
  SBS - is all the hydrotechnical facilities
  Small Boat Shelter gives refuge to CPC-R auxiliary floating craft
  engaged in marine facilities operation and maintenance and
  OSR.

SMP to SPM CPC-1 and SPM CPC-2

SMP to SPM CPC-1 and SPM CPC-2 were put in serivce in 2002. SMP to SPM CPC-1 and SPM CPC-2 run from the shoreline first in an earth and rock filled trench (depth 3 metres, width 9 metres, length 357 metres) and then on the seabed toward SPM CPC-1 and SPM CPC-2.

SMP to SPM CPC-1 and SPM CPC-2 positions:
On the approach to the shore:

Description	**coordinates:**	
	Latitude:	Longitude:
SMP to SPM CPC-1	44° 40′ 10,19" N	037° 39′ 11,07" E
SMP to SPM CPC-2	44° 40′ 10,17" N	037° 39′ 11,2" E

Pipeline end:

Description	coordinates:	
	Latitude:	Longitude:
SMP to SPM CPC-1	44° 37′ 48,26" N	037° 38' 16,94" E
SMP to SPM CPC-2	44° 37' 22,31" N	037° 39′ 39,29" E

Main specifications

Description	SMP
Designer	SEO
Year of build	2001
Year of commissioning	SPM CPC-1 2002; and SPM CPC-2 2002
Number of lines	One to each SPM
Number of welds	SPM CPC-1 364; and SPM CPC-2 423

Working liquid	Crude oil
Design capacity	12,700 m3/h;
design pressure	1925 KPA
Diameter	42'' (1066.80 mm)
Length	SPM CPC-1 4556.1 m SPM CPC-2 5296.8 m

Lifting cranes, fixtures, measuring and safety instruments	not in the design
Codes and standards	for pipeline engineering: API 5L Recommended regulations for pressure testing with liquid API RP-111 Pipeline appurtenances welding standard (1994) API 1104; Regulations for operating the pipeline: SNIP III – 42 – 80; Welding standard: steel: AWS D1 1; Steel pipelines, welds, main types, elements and sizes: SNIP 2.05.06-85; Welding on the pipeline: VSN 00689 Pipeline QA/QC VSN 01288.

Steel API 5L X 52	Depth of water	
	0—17 m 27 m to SPM	17—27 m
Steel pipe outer diameter	42.000	42.000
Steel pipe outer diameter (mm)	1066.80	1066.80
Wall thickness (inches)	0.688	0.688
Wall thickness (mm)	17.48	17.48
YP (kg/cm2)	35.800	35.800
Outer dia to Wall thickness ratio	61.05	61.05
Inertia moment I (cm4)	793,099.29	793,099.29
Inertia module I/v (cm3)	14,868.75	14,868.75
mm2 Steel section	57610.45	57610.45
Stiffness (mt/m2)	16 6383.03	16 6383.03
Moment at yield point 100% (mt/m)	531.77	531.77

Radius at yield point 100% (m)	312.89	312.89
Coating:		
Anti-corrosion (mm)	0.41	0.41
Coating density (mt/m3)	1.300	1.300
Concrete shield thickness (mm)	76.200	88.900
Concrete density (mt/m3) (dry)	3.043	3.043
Concrete density (mt/m3) (wet=+3%)	3.134	3.134
Extreme outer diameter (m)	1.220	1.245
WEIGHT		
Weight in air (kg/m) (dry concrete coating)	12,133.20	13,504.58
Weight in water (kg/m) (wet concrete coating)	113.61	217.28
Specific weight (wet concrete coating)	1.10	1.18
Steel weight (kg/m)	452.24	452.24
Anti-corrosion coating weight (kg/m)	1.77	1.79
Concrete weight (kg/m) (dry)	832.80	982.40
Concrete weight (kg/m) (wet)	857.78	1011.87
Inner volume (m3/m)	0.835	0.835
Work body density (mt/m3)	0.001	0.001
Weight in water, pipe with air (kg/m)	77.54	172.51
Weight in water, pipe with seawater (kg/m)	918.38	1013.38

Anti-corrosion is fusion epoxy
and polyurethane foam:

Epoxy thickness min 406 mm, max 559 mm;

Polyurethane foam thickness is about the same as concrete.

SMP warranty life is 40 years.

SMP to SPM CPC-3

SMP to SPM CPC-3 was put in service in 2013. SMP to SPM CPC-3 runs from the shoreline - first in an earth and rock filled trench (depth 3 metres, width 9 metres, length 357 metres) and then on the seabed toward SPM CPC-3.

Location SMP to SPM CPC-3
On the approach to the shore:

Description	coordinates:

	Latitude:	Longitude:
SMP to SPM CPC-3	44° 40′ 10,20" N	037° 39' 10,92" E

Pipeline end:

Description	coordinates:	
	Latitude:	Longitude:
SMP to SPM CPC-3	44° 37′ 46,73" N	037° 36' 45,26" E

Main specifications

Description	SMP to SPM CPC-3
Designer	Saipem S.p. A.
Year of build	(KP 0.0– 1.05) – 2000; (KP 1.05 – 5.572) - 2012
Year of commissioning	2013
Number of lines	One
Number of welds	451
Working liquid	Crude oil pecific weight 790,0-840,0; viscosity 2,0-9,7 sst; pour point - 18C; flash point -37~ +10
Design capacity	12,700 m3/h;
design pressure	1925 KPA
Diameter	42'' (1066.80 mm)
Length	5591 m
Lifting cranes, measuring and safety instruments	not in the design
Codes and standards	for pipeline engineering: ASME B 31.4; Recommended regulations for pressure testing with liquid API RP-111 Pipeline appurtenances welding standard (1994) API 1104; Regulations for operating the pipeline: SNIP III – 42 – 80; Welding standard: steel: AWS D1 1; Steel pipelines, welds, main types, elemants and sizes: GOST 2 05 06; Welding on the pipeline: VSN 00689 Pipeline QA/QC VSN 01288.
Pipeline environment particulars for operation:	
Mean depth of sea	56 metres
Sea height	up to 3 metres

Wind speed	Up to 23 sec
Surface current speed	About 0.5 m/sec
Sea temperature	From +10 to +26 deg. C
Ambient air temperature	From -24 to +39 deg. C

Steel API 5L X 52	Depth of water	
	0 m —17 m 27m to 30.5 m	17 m —27 m
Steel pipe outer diameter	42.000	42.000
Steel pipe outer diameter (mm)	1066.80	1066.80
Wall thickness (inches)	0.688	0.688
Wall thickness (mm)	17.48	17.48
YP (kg/cm2)	35.800	35.800
Outer dia to Wall thickness ratio	61.05	61.05
Inertia moment I	793,099.29	793,099.29
Inertia module I/v (cm3)	14,868.75	14,868.75
мм2 Steel section	57610.45	57610.45
Stiffness	16 6383.03	16 6383.03
Moment at yield point 100%	531.77	531.77
Radius at yield point 100% (m)	312.89	312.89
Coating:		
Anti-corrosion (mm)	0.41	0.41
Coating density	1.300	1.300
Concrete shield thickness (mm)	76.200	88.900
Concrete density (dry)	3.043	3.043
Concrete density (wet=+3%)	3.134	3.134
Extreme outer diameter (m)	1.220	1.245
WEIGHT		
Weight in air (kg/m) (dry concrete coating)	12,133.20	13,504.58
Weight in water (kg/m) (wet concrete coating)	113.61	217.28
Specific weight (wet concrete coating)	1.10	1.18
Steel weight (kg/m)	452.24	452.24
Anti-corrosion coating weight (kg/m)	1.77	1.79
Concrete weight (kg/m) (dry)	832.80	982.40

Concrete weight (kg/m) (wet)	857.78	1011.87
Inner volume (m3/m)	0.835	0.835
Work body density	0.001	0.001
Weight in water, pipe with air (kg/m)	77.54	172.51
Weight in water, pipe with seawater (kg/m)	918.38	1013.38

Anti-corrosion is fusion epoxy coating

Polyurethane foam:

Epoxy thickness min 406 mm, max 559 mm;

Polyurethane foam thickness is about the same as concrete.

PIPELINE CHARACTERISTICS FROM PK 1.05 TO PK 5.572	
Steel API 5L X 52	Depth of water 30.5 m — 58 m
Steel pipe outer diameter	42.000
Steel pipe outer diameter (mm)	1067
Wall thickness (inches)	0.874
Wall thickness (mm)	22.2
YP (kg/cm2)	35.800
Outer dia to Wall thickness ratio	48.06
Inertia moment I	793,099.29
Inertia module I/v (cm3)	14,868.75
мм2 Steel section	57610.45
Stiffness	16 6383.03
Moment at yield point 100%	531.77
Radius at yield point 100% (m)	312.89
Coating:	
Anti-corrosion (mm)	0. 40
Coating density	1.300
Concrete shield thickness (mm)	76.00
Concrete density (dry)	3.043
Concrete density (wet=+3%)	3.134
Extreme outer diameter (m)	1.219
WEIGHT	
Weight in air (kg/m) (dry concrete coating)	17,321.62
Weight in water (kg/m) (wet concrete coating)	217.28
Specific weight (wet concrete coating)	1.18
Steel weight (kg/m)	590.16

Anti-corrosion coating weight (kg/m)	1.79
Concrete weight (kg/m) (dry)	982.40
Concrete weight (kg/m) (wet)	1011.87
Inner volume (m3/m)	0.835
Work body density	0.001
Weight in water, pipe with air (kg/m)	172.51
Weight in water, pipe with Seawater (kg/m)	1013.38

Anti-corrosion is fusion epoxy

Polyurethane foam:

Epoxy thickness min 400 mm, max 800 mm;

Polyurethane foam thickness is about the same as concrete.

PIG LAUNCHER RECEIVER

Equipment for scheduled SMP scraping and smart pigging PLR are on SF Each SMP has its own PLR PLR is bi-directional allowing launching and retrieving pigs For PLR drawing see Exhibit 2

PLEMs

PLEM connects SMP to SPM buoy PLEM is part of the SPM lying in a depth of 55-60 metres PLEM does not allow retrieving a pig For PLEM drawing see Exhibit 1

4. Description of Services:

Contractor work scope includes:

Development and obtaining CPC-R approval for SMP and PLR diagnostics

Development and obtaining CPC-R approval for work schedule;

Development and obtaining CPC-R approval for SMP scraping (if need be)

Delivery, preparation and servicing of pigs (including cleaning);

Smart pigging and industrial safety expertise of the three SMP with a self-propelled bi-directional smart pig Guarantee free movement of the pig along the entire length of the SMP forth and back with no risk of hawser breaking and SMP blocking

If the pig self-propelling fails during SMP pigging (in any section) the pig must be safely returned to the PLR with contractor hawser and winch. Immediate

Participation and supervision over the launching, passing and retrieving;

Tracking the pig, data acquisition and processing;

SMP fault, anomaly and particulars detection and database and

Establishing coordinates of:

- Any pipe section faults (ovality, buckle, dent);
- Pipe wall and weld defects: metal, corrosion, mechanical nature (splits, pores, slag inclusions, internal and external corrosion, scoring, scratches, etc.);
- cracks and similar defects (longitudinal and transverse in welds and base metal);

- edge misalignment of annular welds;
- pipe wall thickness reduction;
- registration of welded joints, structural elements of SMP and pipe layouts;
- measurement of rotation radii, determination of spatial position and length of SMP;

- use smart pigs on different physical principles to eliminate low probability of

detection of various defects;
Before smart pigging obtain the WEP approval from Russia Register of Shipping;
make:

1. An adapter cover for the 42-LR-A103 PLR, which must be securely fixed in the lock and ensure that the chamber is leak proof. In the adaptive cover must be mounted gland assembly, which ensures the seal of the chamber with free movement of cables and pig hawsers;
2. gland assemblies for 42-LR-A101 and 42-LR-A102 , which must be installed (instead of plugs) in the central holes of existing covers ensuring the chamber is leak proof with free movement of cables pig hawser;

Do diagnostics and industrial safety expertise of the three PLR's with equipment;
Valving and piping (inclusive of drain piping)
Using external scanners and flaw detectors;
Opening and back filling of pits (if need be), preparation of the surface
of PLR and pipelines for flaw detection;
- restoration of insulation, coating, in case of removal or damage during the work.
Contractor is solely responsible for registration of
Industrial Safety Expertise with RTN local authority.

5. Russia Register of Shipping Contractor requirements:

Smart pigging shall be done as per the Regulations for
Monitoring of building and operation of submarine pipeline ND No. 2-030301-002;
Reports to be sent to the Register for approval and registration;
Register surveyor to witness smart pigging;
Contractor to have Russia Register of Shipping Certificate
Authorising smart pigging (Code 24002000 smart pigging
of submarine pipeline witnessed by Register surveyor)

6. RTN Contractor requirements:

Smart pigging must take into account the Safety Manual "Technical Diagnostics of Linear Part Pipelines and Process Pipelines of Trunk Oil Pipelines and Oil Products Pipelines" related to examination of SMP;
Submit a valid license for
Industrial Safety Expertise as per

Federal Service for Environmental, Technological and Nuclear Supervision;
Submit NTD accreditation certificates of the laboratory engaged in examination and reporting;
Submit pig manufacturer's certificate and Customs Union Technical Regulations Conformity Certificate;
Confirm that qualified NTD personnel are available;
Confirm that Industrial Safety Experts are available for Hazardous Facility Class I;
Personnel must be certified as per industrial safety requirements for works of this type;
Ensure that gas analysers are available with proving certificates;
Ensure that enough blast proof VHF radios are available;

Have the reports and Industrial Safety Expertise registered with RTN

7. Report format and numbers

There must be separate SMP smart pigging reports and PLR troubleshooting reports.
Report to contain:
Explanatory Note:

- Technical characteristics and description of the flaw detector performance, flaw detection methods, measurement methods;
- flaw detection object description;
- Specifications:
- Work progress;
- Strength calculation results and defects pre-repair classification;
- results of diagnostic information processing and a brief description of the detected features;
- list and coordinates of reference points (marker points) on which the devices registering the passage of flaw detectors were installed;
- charts and graphs based on the results of statistical data analysis;
- smart pig passage acts;
- Contractor permits and licenses for the works;
- information on failures of diagnostic equipment, violations of the technology of preparation and execution of diagnostic works, as well as any deviations of the procedure of diagnostic works from the established regulatory requirements.

Special features lists and log:

- Loss of metal (external and internal);

- scores, scratches, galling (related to the loss of metal);
  ovality, dents, corrugations.
- layers (including those dangerous according to the results of strength calculation, near the weld reaching the surface);
- Changes of wall thickness;
- Pipeline welds and other structural elements;
- repair pipeline structures (patches and other structural elements welded to pipes, including those not regulated by regulations);
- Pipeline fixtures;
- Other features (foreign objects, rings, etc.), jackets (start and end);
- Defects of welds (cracks, weld irregularity, undercuts, gas pores, edge misalignment, cold laps);
- Stress corrosion cracking;
- geometrical position of pipelines with reference to markers and geographical coordinates.

- Layout log of elements with average wall thickness of pipe sections,
type and angular position of the welds adjacent to the transverse weld.

Defect classification. Stipulate for each defect that need repair
Recommended dates and methods;

Issue an express report on completion of each object diagnostics;

Conclusion:

1. Condition
2. Further safe operation life;
3. Required maintenance supervision activities (if necessary),
4. Next diagnostics time;
5. Comparative state analysis (overlapping) with respect to the previously performed survey (reports will be provided by the CPC).

Develop a service program to work with diagnostic information that allows:

- By user commands, add fields to the table of defects and features (such as CP potential, height profile, insulation coating data, etc.);
- the database, information about defects, features and marker points shall be presented as a single database (pipeline log);
- Read the "raw" data recorded in the hard disc continuous area;
- Work with survey database;
- automatically select the necessary information using the filter and index mechanism;
- Data to be submitted graphically;
- enter information about the repair carried out (if repair necessary);
- generate reports in the form specified by the user;
- Export the databases to MC Excel;

Reports shall contain:
- Printed copy - 3 copies for each SMP in Russian and English languages;
- Printed copy - 3 copies for each PLR in Russian and English languages;
- soft copy (hard disc) with computer databases and
Flaw detector data - 2 copies

8. Industrial Safety Expertise requirements:

Composition and content of the Industrial Safety Expertise shall comply with the Federal codes and standards on industrial safety "Rules of industrial safety expertise", Section IV; p.p.21.1; 21.2; 21.3; 21.4.

9. Contractor's Additional commitments:

For two years following the smart pigging:
- bear financial responsibility for a missed defect that could lead to a pipe rupture (taking into account the limitations of the diagnostic method, corrosion growth rate, changes in pipeline operating conditions, etc.);
- In case of problems with positioning of defects in situ, Contractor will provide a specialist in non-destructive testing at its own expense.

Contractor provides customs clearance for import and export of all equipment (including smart pigs, the required number of scrapers for the pre-diagnostic cleaning of the oil pipeline), devices and materials required for diagnostic work. The Contractor will ensure at its own expense the delivery of equipment and personnel to the Marine terminal, as well as transport support throughout the work.

10. HSE requirements to Contractor

The issues of interaction between the Company and the future Contractor in the field of health, safety and environment protection in the performance of the Works, and the Services by the Contractor, are given in Appendix 3 of this Assignment and will be an integral part of the future Contract.

11. Regulatory documents

1. Monitoring of building and operation of submarine pipelines ND No. 2-030301-002;
2. GOST R 54907-2012
3. - Safety guidelines "Technical Diagnostics of Line Pipe and Process Piping of Oil and Petroleum Product Pipelines" related to the Marine Terminal SMP;
4. CPC VRD 45.07.2004 Regulations for smart pigging
5. CPC VRD 56.07.2018 Regulations for process and auxiliary piping operation

EXHIBITS

1. Exhibit 1 - PLEM drawing
2. Exhibit 2 - PLR drawing
3. Exhibit 3 - HSE Requirements to Contractors;
4. VRD CPC VRD 45.07.2004.

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