طرح نگهداشت و افزایش تولید 27 مخزن

PIPELINE WALL THICKNESS CALCULATION

نگهداشت و افزایش تولید میدان نفتی بینک

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Status:

IDC: Inter-Discipline Check
IFC: Issued For Comment
IFA: Issued For Approval
AFD: Approved For Design
AFC: Approved For Construction
AFP: Approved For Purchase
AFQ: Approved For Quotation
IFI: Issued For Information
AB-R: As-Built for CLIENT Review
AB-A: As-Built –Approved

REVISION RECORD SHEET

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1.0 INTRODUCTION

Binak oilfield in Bushehr province is a part of the southern oilfields of Iran, is located 20 km northwest of Genaveh city.

With the aim of increasing production of oil from Binak oilfield, an EPC/EPD Project has been defined by NIOC/NISOC and awarded to Petro Iran Development Company (PEDCO). Also PEDCO (as General Contractor) has assigned the EPC-packages of the Project to "Hirgan Energy - Design and Inspection" JV.

As a part of the Project, construction of well location, access roads, wellhead facilities for 6 new wells (with electric power supply for 2 of them) and required modifications on 4 workover wells (with electric power supply) shall be done. In addition, construction of 6 new flowlines from new wells to Binak B/C unit (with extension of relevant manifold) are in the Project scope of work.

GENERAL DEFINITION

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields Company (NISOC)
PROJECT:	Binak Oilfield Development – Construction of New Well Locations, Modifications on Workover Wells, Wellhead Facilities, Electrification Facilities, Flowlines and Extension of Binak B/C Manifold
EPD/EPC CONTRACTOR (GC):	Petro Iran Development Company (PEDCO)
EPC CONTRACTOR:	Joint Venture of : Hirgan Energy – Design & Inspection (D&I) Companies
VENDOR:	The firm or person who will fabricate the equipment or material.
EXECUTOR:	Executor is the party which carries out all or part of construction and/or commissioning for the project.
THIRD PARTY INSPECTOR (TPI):	The firm appointed by EPD/EPC CONTRACTOR (GC) and approved by CLIENT (in writing) for the inspection of goods.
SHALL:	Is used where a provision is mandatory.
SHOULD:	Is used where a provision is advisory only.
WILL:	Is normally used in connection with the action by CLIENT rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR.
MAY:	Is used where a provision is completely discretionary.

2.0 SCOPE

This document covers the wall thickness calculation for Binak 6 new wellheads and flow lines based on IPS standard (IPS-E-PI-140), ASME B 31.4 and ASME B 31.8.

3.0 NORMATIVE REFERENCES

The latest edition of following codes & standards are applicable in this project (unless otherwise):

3.1 LOCAL CODES AND STANDARDS

- IPS-E-PI-140 Engineering Standard for Onshore Transportation Pipelines
- IPS-M-PI-190 Material and Equipment Standard for Line Pipe
- NOSIC-S4L8001-001D 3000 API Rating Production Wellhead Fittings-6”
- NOSIC-S4L8004-001C 3000 Bangestan Production Wellhead Fittings-6”
- NOSIC-S5L-9002-0010 5000API/3000 API Oil Well Production Wellhead Fittings 6”

3.2 INTERNATIONAL CODES AND STANDARDS

- ASTM American Society for Testing Materials Relevant Parts
- API 5L Specification for Line Pipe
- ASME B31.8 Gas Transmission and Distribution Piping Systems
- ASME B31.4 Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids Unified screw threads
- ASME B 36.10 Welded and Seamless Wrought Steel Pipe
- NACE MR 0175-ISO 15156 Petroleum and Natural Gas Industries. Materials for use in H2S Containing Environments in Oil and Gas Production

3.3 THE PROJECT DOCUMENTS

- BK-SSGRL-PEDCO-110-PL-RT-0001 Pipeline Corrosion Study & Material Selection Report
- BK-GNRAL-PEDCO-000-PR-DB-0001 Process Basis of Design
- BK-GNRAL-PEDCO-000-PL-DC-0001 Pipeline Design Criteria

- BK-SSGRL-PEDCO-110-PL-SP-0001 Pipeline Material Specification

3.4 ENVIRONMENTAL DATA

- Refer to "Process Basis of Design; Doc. No. BK-GNRAL-PEDCO-000-PR-DB-0001".

3.5 ORDER OF PRECEDENCE

In case of any conflict between requirements specified herein & the requirements of any other referenced document, this subject shall be reflected to CLIENT and the final decision will be made by CLIENT.

4.0 GENERAL

Candidate material for pipeline as per Corrosion Study & Material Selection Report (with Doc. No. BK-SSGRL-PEDCO-110-PL-RT-0001) is carbon steel with 3 mm corrosion allowance. This document presents the calculation procedure of carbon steel pipeline wall thickness.

The types, size, length, operating & design pressure and temperature and service condition of pipelines (according to process documents such as Process Basis of Design with Doc. No. BK-GNRAL-PEDCO-000-PR-DB-0001, Pipeline Design Criteria with Doc. No. BK-GNRAL-PEDCO-000-PL-DC-0001) are as following tables.

5.0 CALCULATION NOTE & DESIGN DATA

5.1 GENERAL

The required thickness of straight sections of pipe shall be determined in accordance with Eq. (2) tm = t + c

5.2 NOMENCLATURE

tm: Minimum required thickness, including mechanical, corrosion, and erosion allowances

- **t** Calculated Wall Thickness (in)
- **ts** Selected Wall Thickness (in)
- **P** Design Pressure (psig)
- **D** Nominal Pipe Diameter (in)
- **SMYS** Specified Minimum Yield Strength (psi) (as per appendix D)
- **F** Design Factor (as per Table 841.1.6-2)
- **E** Longitudinal Joint Efficiency (as per Table 841.1.7-1)
- **T** Temperature Derating Factor (as per Table 841.1.8-1)

- **C** Corrosion & Erosion Allowance (in)

5.3 CALCULATION FORMULA

Calculation of pres. design THK. for straight pipe requires special consideration of factors such as theory of failure, effects of fatigue, and thermal stress.

$$T_m = [(P \times D) / (2SMYS \times FET)] + C$$

6.0 LINE SERVICE INDEX

Class	Rating Face	Base Material	C.A (mm)	Design Code	Design Temp. (°C) Max.	Design Pressure (psig) Max.	Fluid	Symbol	State
Flowline									
LN15	API 3000 RTJ	C.S	3	ASME B31.4	85	1035	Crude Oil	CRD	Liquid

7.0 THICKNESS CALCULATION

Piping Class	Material	Design PRESS. <P> (Psig)	Design TEMP. (deg. C)	Corrosion Allowance <C>(mm)	Specific Min. Yield <S> (Psi)	Design Factor <F>	Welding Factor <E>
LN15	API 5L-B PSL 2 for <2”	1035	85	3	35000	0.72	1.00
	API 5L-X52 PSL 2 for ≥2”				52000		

CALCULATING PROCEDURE BY ASME B31.4

$$t = \frac{P \times D}{2 \times S \times 0.72 \times E \times T}$$

$$tm = t + C$$

where ;

tm = minimum required thickness (mm)
t = calculated thickness (mm)
C = corrosion allowance (mm)
P = design pressure (Psig)
D = outside diameter (mm)
S = specific minimum yield strength (Psi)
E = Weld Joint Factor
F = design factor
T = Temperature Derating Factor = 1

NPS	PIPE O.D.	CALCULATED THICKNESS		SELECTED WALL THICK. (mm)
Inch	<D> (mm)	t (mm)	tm (mm)	
1/2	21.3	0.432	3.432	Sch. 80
3/4	26.7	0.559	3.559	Sch. 80
1	33.4	0.686	3.686	Sch. 80
1 1/2	48.3	0.991	3.991	Sch. 80
2	60.3	0.838	3.838	Sch. 40
3	88.9	1.219	4.219	Sch. 40
4	114.3	1.575	4.575	Sch. 40
6	168.3	2.337	5.337	7.9 mm **(Note 1)**

Note 1:
Although calculated thickness for 6” pipe is 5.33 mm, based on experiences of south oil fields, 7.9 mm has been considered as selected thickness.