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طرح نگهداشت و افزایش تولید 27 مخزن

HYDROSTATIC TEST PROCEDURE FOR HEAT EXCHANGERS

نگهداشت و افزایش تولید میدان نفتی بینک

V00	APR. 2025	IFA	MFS	M.Fakharian	S.Faramarzpour	
Rev.	Date	Purpose of Issue/Status	Prepared by:	Checked by:	Approved by:	CLIENT Approval

Status:

IFA: Issued For Approval
IFI: Issued For Information
AFC: Approved For Construction

 <p>NISOC</p>	<p>نگهداشت و افزایش تولید میدان نفتی بینک</p> <p>سطح الارض و ابنیه تحت الارض</p> <p>خرید بسته نم زدای گاز ایستگاه تقویت فشار گاز بینک</p> <p>(قرارداد BK-HD-GCS-CO-0010_08)</p>																	
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1. SCOPE

This procedure covers requirements of Hydrostatic Test, which will be applied by Masnouat Felezi Sangin Co. for heat exchangers of Binak Oilfield Development – General Facilities Project.

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Applicable equipment:

Row	Tag No.
1	E-100
2	E-200
3	E-300

2. DEFINITIONS

CLIENT:	National Iranian South Oilfields Company (NISOC)
PROJECT:	Binak Oilfield Development – General Facilities
EPD/EPC CONTRACTOR (GC):	Petro Iran Development Company (PEDCO)
EPC CONTRACTOR:	Joint Venture of: Hiran Energy – Design & Inspection(D&I) Companies
VENDOR:	MFS Co.

3. REFERENCE DOCUMENTS

- ASME SECTION VIII DIV.1 Edition 2021
- API 660
- General Arrangement Drawing for E-100 (Doc No.: BK-GCS-MF-120-ME-DW-0017)
- General Arrangement Drawing for E-200 (Doc No.: BK-GCS-MF-120-ME-DW-0020)
- General Arrangement Drawing for E-300 (Doc No.: BK-GCS-MF-120-ME-DW-0023)

4. HYDROSTATIC TEST

4.1. PRIMARY INSPECTION

- Prior to testing, the inner part of the heat exchanger shall be cleaned and free from dirt, debris, loose scale and slag, pieces of metal, weld spatter, oil and grease, etc.
- All welding will be finished and fully accepted by NDT examination.
- External surfaces will be dried for correct execution of visual inspection.
- Before applying the pressure test, equipment will be examined to see that it is tight.

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- 5) Hydrostatic test shall be done prior to painting at weld and/or coating.
- 6) Abnormal deformation or leak test medium is not acceptable.
- 7) The test shall be done after final heat treatment.
- 8) Visual inspection before, during and after the test will be carried out.

4.2. Required Equipment

1) High-Pressure hydraulic pump:

Hydrostatic test will be carried out by using high-pressure hydraulic pump and also using the here below accessories, manometer, high-pressure valves and fittings. Hydraulic pump pressure is equal to 136 Bar.

2) Pressure Gauge:

For the execution of this test, as a minimum, two pressure gauges shall be installed, one on the top part of the vessel and other one on the bottom part. The pressure indicated by the top PG shall be considered as the hydrotest pressure. The Pressure gauges shall be calibrated for the range of test pressure and their valid certificates shall be available at the time of inspection for involved inspection parties.

$$(1.5 * P_{Test} < \text{range of pressure gauge} < 4 * P_{Test}).$$

3) Hydrotest Water:

- Hydrostatic testing will be carried out with cleaned water free from suspended particles and other extra factors, whose existence will cause, disturb gauges operation.
- Heat exchangers shall be hydrostatically tested with potable water only; salt, brackish, or raw river water shall not be used. The chloride content of the test water used for equipment with austenitic stainless-steel materials that would be exposed to the test fluid shall not exceed 50 mg/kg (50 parts per million by mass). Upon completion of the hydrostatic test, the equipment shall be promptly drained and cleared of residual test fluid.

4.3. HYDROSTATIC TEST PRESSURE

- 1) Heat exchangers will be hydrostatically tested to the pressure indicated on engineering drawings in accordance with ASME SEC. VIII, Div.1.
- 2) Following table indicates equipment tag number and test pressure:

Tag No	Design Pressure (Barg)		Test Pressure (Barg) (Note)	
	Shell Side	Tube Side	Shell Side	Tube Side

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E-100	6.6	8.5	11.35	11.1
E-200	5.8	7.5	7.5	10
E-300	62	59	80.6	76.7

Note: In case of conflict between this procedure and approved general arrangement drawing, the latest revision of approved General arrangement drawing is applicable.

5. Testing of the Equipment by using Hydrostatic Test Method

After the entire equipment is completed but before any permanent external piping is connected to the equipment, the equipment shall be tested by Hydrostatic Testing. This Test shall be performed after completing equipment fabrication and finishing all of the welding operation and NDT, air leak test of reinforcing pads vacuum box test and PWHT, prior to painting and / or insulation.

Hydrostatic testing methods consist of filling a Tank System with a fluid (Water) and pressurizing will be done from the lowest point and venting will be done from the highest point. After filling, a water overflow through the venting is produced in order to assure that no air bubbler remain in the heat exchanger. Injecting water into the equipment (closed the vents at the top of the tank) slowly until the pressure in about one-half the pressure P_g . (See Table). After that increasing pressure slowly up to P_g . (See Table) and held for 1 hour. The water pressure shall then be reduced test pressure divided by 1.3 and hold for minimum 10 minutes. Visual inspection before, during and after the test will be carried out. In case of occurring any leakage at any stage, the test shall be stopped, heat exchanger emptied up and afterward repairs on leaks shall be done and again all the above procedures shall begin to continue the hydrostatic test by purchaser approval.

During test operation, inspector shall check for conformity with design drawings and specification, accessibility of valves, controls and gages and proper installation of water pumps. All equipment should be checked for correct identification and operating instructions.

6. TEST EXECUTION

- 6.1 For the execution of test, openings will be closed by blind flanges or screwed disk.
- 6.2 Filling and pressurizing will be done from the lowest point and venting will be done from the highest point.

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- 6.3 After filling, a water overflow through the venting is produced in order to assure that no air bubbler remain in the heat exchanger.
- 6.4 Test pressure: unless otherwise specified in drawing or Client specification, is at least equal to 1.3 times the maximum design pressure (or working pressure when exist) to be marked on the heat exchanger multiplied by the lowest ratio of the stress value S for the test temperature on the heat exchanger to the stress value S for the design temperature.
- 6.5 Visual inspection before, during and after the test will be carried out.
- 6.6 The test pressure shall be held for at least an hour.
- 6.7 The hydrostatic pressure in the heat exchanger shall be increased gradually to reach the amount mentioned in the calculation book. Thereafter, the test pressure shall be increased.
- 6.8 When the pressure testing is completed, slowly released the pressure to test pressure divided by 1.3 and hold for minimum 10 minutes.
- 6.9 Leakage from temporary seals will be directed away so as to avoid masking leaks from other joints e.g., manhole and temporary attachments.
- 6.10 In case of occurring any leakage at any stage, the test shall be stopped, heat exchanger emptied up and afterward repairs on leaks shall be done and again all the above procedures shall begin to continue the hydrostatic test by purchaser approval.
- 6.11 The heat exchanger will be drained and dried immediately after the test. The parts that water can be settled in which will be dried by hot air.
- 6.12 7Hammering on the shell is not allowed during the test.
- 6.13 7.13 Do not allow anyone on, near the heat exchanger while pressure is being applied for first time or while pressure is greater than design pressure.
- 6.14 7.14 Heat exchanger to be hydrostatically tested in shop and in the horizontal position shall be supported to adequately keep local stresses in the shell low and not exceeding 90% of the yield strength of the material.
- 6.15 The hydrostatic test pressure shall be maintained for an adequate time to permit a thorough inspection; in any case not less than 1 hour.

7.1. Hydrostatic test stage based on heat exchanger type

Test Sequence by Considering Exchanger Type is as follow:

- 1- shell side
- 2- tube side
- 3- final shell side

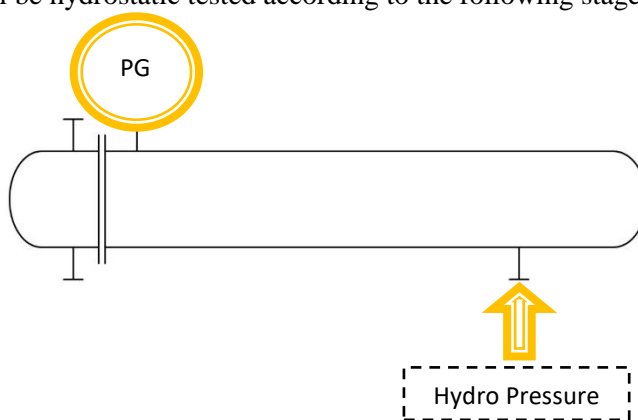
Depending on Heat Exchanger type, “final shell side” test shall be divided into 2 sub-sections as explained below:

- 3.1. Final shell side test for all fixed Types, U-Types and Floating type (with equal Shell/tube side test pressure) heat exchangers shall be executed using pneumatic test (at 1 bar). It should be mentioned that this test will be implemented after “surface preparation & paint” and before “N2 purge” process.

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3.2. For the remaining floating types (Tube side test pressure higher than shell side) this test shall be executed according to “Related Construction Standards/ Standards Drawings for Heat Exchangers”.
Heat exchangers will be hydrostatic tested according to the following stages:

Shell side:



Tube side:

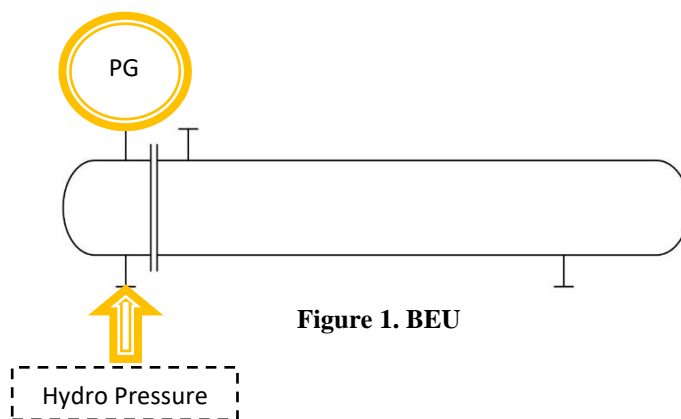


Figure 1. BEU

7.2. Leak Check Test for Tube-to-Tube Sheet

Tube to tube sheet joint shall be checked from higher pressure side at gauge pressure between 50 kPa and 100 kPa(Clause 10.2.1 API 660), using a soap-water solution to identify leaks.

7. PNEUMATIC TEST

Pneumatic tests will be carried out on nozzle reinforcement pad. They will be performed with air between 100 kPa (ga) (15 psig) and 170 kPa (ga) (25 psig) using soap solutions before hydrostatic test and pneumatic test report will be recorded in accordance with the attachment.

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8. REPAIRS

If any pressure drop is detecting during test, heat exchanger will be depressurized and repairs will be done, if necessary, before refilling water. The related NDTs will be performed after the repair and hydro-test will be repeated after repair of leakage area.

9. REPORTING

For samples of hydrostatic & pneumatic tests refer to attachments.

	<p>Hydrostatic Test Inspection Report</p>	
<p>REFERENCE CODE:PR-08-01</p>		<p>FORM CODE:FR-08/01/19</p>

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REVISION NO.:05		REVISION NO.:05	
REVISION DATE: 2024-05-29		REVISION DATE: 2024-05-29	
Project:	OWNER:	Report No:	
Reference:	Equipment No.:	DWG NO.:	
ITP No:	Report Date:	Page:	
Test Liquid:	Test Pressure:	Design Pressure:	
Operating Pressure:	Metal Temperature:	Holding Time:	
Pressure Gauge:	Pressure Range:	MDMT:	
Test Result: T			
V:	C:	O:	T:

