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|  | <p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض</p> <p>خرید مخازن ذخیره ایستگاه تقویت فشار گاز بینک (قرارداد BK-HD-GCS-CO-0026_00)</p> | | | | | | |  |
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طرح نگهداشت و افزایش تولید ۲۷ مخزن

VACUUM & OIL LEAK TEST PROCEDURE

نگهداشت و افزایش تولید میدان نفتی بینک

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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.

GENERAL DEFINITION

The following terms shall be used in this document.

| | |
|--------------------------|---|
| CLIENT: | National Iranian South Oilfields Company (NISOC) |
| PROJECT: | Binak Oilfield Development – Supply STORAGE TANK |
| EPD/EPC CONTRACTOR (GC): | Petro Iran Development Company (PEDCO) |
| EPC CONTRACTOR/PURCAHSE: | Joint Venture of: Hirgan Energy – Design & Inspection Companies (HE/DI) |
| VENDOR: | iDrill Middle East (iDrill M.E) |
| EXECUTOR: | Executor is the party which carries out all or part of construction and/or commissioning for the project. |
| TPI: | Third-Party Inspector |
| SHALL: | Is used where a provision is mandatory. |
| SHOULD: | Is used where a provision is advisory only. |
| MAY: | Is used where a provision is completely discretionary. |

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2.0 SCOPE

The purpose of this procedure is providing a guide line to carry out the Vacuum box test to check soundness of annular joints, bottom (long seam & short seam) and defines the requirements to be allowed for Oil Leak Test of parts the shell to bottom weld, after finish weld from inside the shell for Lean Glycol Storage Tank (TK-2102) and Fire Water Tanks (TK-2301A/B).

3.0 REFERENCES CODE AND STANDARD

- API-650
- ASME Sec. – V
- IPS-G-ME-100

4.0 PERSONNEL

The Manufacturer shall determine that each vacuum-box operator meets the following requirements:

- a. has vision (with correction, if necessary) to be able to read a Jaeger Type 2 standard chart at a distance of not less than 300 mm (12 in.). Operators shall be checked annually to ensure that they meet this requirement; and
- b. is competent in the technique of the vacuum-box testing, including performing the examination and interpreting and evaluating the results; however, where the examination method consists of more than one operation, the operator performing only a portion of the test need only be qualified for that portion the operator performs.

5.0 RESPONSIBILITY

The personnel of QC Inspector shall execute the Oil Test Examination according to this procedure and the applicable codes.

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6.0 VACCUME TEST

6.1 PURPOSE

All bottom plate welds shall be tested using a vacuum box which enables any leak in the seams to be positively located by visual examination (in accordance with section 6.6 of API standard 650) alternatively, if a vacuum testing box is not available, the bottom seams may be tested by pumping air beneath the bottom plates to a pressure just sufficient to lift them off the foundation, but to a maximum of 0.7 Kpa.

6.2 EQUIPMENT

- 6.2.1** Vacuum testing is performed using a testing box approximately 150 mm (6 in.) wide by 750 mm (30 in.) long with a clear window in the top, which provides proper visibility to view the area under examination. During testing, illumination shall be adequate for proper evaluation and interpretation of the test. The open bottom shall be sealed against the tank surface by a suitable gasket. Connections, valves, lighting and gauges, as required, shall be provided. A soap film solution or commercial leak detection solution, applicable to the conditions, shall be used.
- 6.2.2** As an alternate to vacuum-box testing, a suitable tracer gas and compatible detector can be used to test the integrity of welded bottom joints for their entire length. Where tracer gas testing is employed as an alternate to vacuum-box testing, it shall meet the following requirements:

- Tracer gas testing shall be performed in accordance with a written procedure which has been reviewed and approved by the Purchaser and which shall address as a minimum: the type of equipment used, surface cleanliness, type of tracer gas, test pressure, soil permeability, soil moisture content, satisfactory verification of the extent of tracer gas permeation, and the method or technique to be used including scanning rate and probe standoff distance.
- The technique shall be capable of detecting leakage of $1 \times 10^{-4} \text{ Pa m}^3/\text{s}$ ($1 \times 10^{-3} \text{ std m}^3/\text{s}$ or smaller).
- The test system parameters (detector, gas, and system pressure, i.e., level of pressure under bottom) shall be calibrated by placing the appropriate

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calibrated capillary leak, which will leak at a rate consistent with (b) above, in a temporary or permanent fitting in the tank bottom away from the tracer gas pressurizing point. Alternatively, by agreement between the Purchaser and the Manufacturer, the calibrated leak may be placed in a separate fitting pressurized in accordance with the system parameters.

- d. While testing for leaks in the welded bottom joints, system parameters shall be unchanged from those used during calibration

6.3 SURFACE PREPARATION

The surface to be examined and all adjacent areas shall be cleaned thoroughly and free from all dirt, grease, lint, scale, welding flux, weld spatters, paint, oil and other extraneous matter that could obstruct surface openings or otherwise with the examination. Prior to vacuum testing all joints shall be checked visually.

6.4 PROCEDURE

- 6.4.1** The metal surface temperature limits shall be between 4 °C (40 °F) and 52 °C (125 °F), unless the film solution is proven to work at temperatures outside these limits, either by testing or Manufacturer's recommendations.
- 6.4.2** A minimum light intensity of 1000 Lux (100 fc) at the point of examination is required during the application of the examination and evaluation for leaks.
- 6.4.3** The vacuum shall be maintained for the greater of either at least 5 seconds or the time required to view the area under test.
- 6.4.4** Vacuum testing shall be performed in accordance with a written procedure prepared by the Manufacturer of the tank. The procedure shall require:
- performing a visual examination of the bottom and welds prior to performing the vacuum-box test;
 - verifying the condition of the vacuum box and its gasket seals;
 - verifying that there is no quick bubble or spitting response to large leaks;
- and

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d. applying the film solution to a dry area, such that the area is thoroughly wetted and a minimum generation of application bubbles occurs.

6.4.5 A partial vacuum of 21 kPa ($\frac{3lb_f}{in^2}$, 6 in. Hg) to 35 kPa ($\frac{5lb_f}{in^2}$, 10 in. Hg) gauge shall be used for the test.

6.4.6 If specified by the Purchaser, a second partial vacuum test of 56 kPa ($\frac{8lb_f}{in^2}$, 16 in. Hg) to 70 kPa ($\frac{10lb_f}{in^2}$, 20 in. Hg) shall be performed for the detection of very small leaks

6.4.7 The vacuum-box test shall have at least 50 mm (2 in.) overlap of previously viewed surface on each application.

6.4.8 The weld seam on the test shall be applied with a bubble solution for detecting leaks prior to placing vacuum box.

6.4.9 An Overlap of 2" minimum for adjacent placement of the Vacuum box shall be given for each subsequent examination.

6.5 EVALUATION

The presence of a through-thickness leak indicated by continuous formation or growth of a bubble(s) or foam, produced by air passing through the thickness, is unacceptable. The presence of a large opening leak, indicated by a quick bursting bubble or spitting response at the initial setting of the vacuum box is unacceptable. Leaks shall be repaired and retested.

6.6 REPAIR / RETEST

Defects in welds shall be repaired by chipping, grinding or melting out the defects from one side or both sides of the joints, as required and rewelding. Only the cutting out of defective joints that is necessary to correct the defects is required. After repairing retest of Vacuum box test shall be carried out.

6.7 CLEANING

After test the area shall be thoroughly cleaned for the further activities.

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6.8 INSPECTION REPORT

A record or report of the test including a statement addressing temperature and light intensity shall be completed and furnished to the Purchaser upon request.

The test shall be carried out in presence of the TPI. Upon satisfactory inspection, a report shall be prepared as per Hiran Energy approved format.

7 OIL LEAK TEST

7.4 PROCEDURE

7.4.1 The initial weld pass inside the shell shall have all slag and non-metals removed from the surface of the weld and then examined for its entire circumference both visually and by one of the following methods to be agreed to by Purchaser and the Manufacturer. If method "a" is applied, either inside or outside weld may be deposited first. If

method b, c, d, or e is applied, the inside weld shall be deposited first:

- a) magnetic particle;
- b) applying a solvent liquid penetrant to the weld and then applying a developer to the gap between the shell and the bottom and examining for leaks after a minimum dwell time of one hour;
- c) applying a water-soluble liquid penetrant to either side of the joint and then applying a developer to the other side of the joint and examining for leaks after a minimum dwell time of one hour;
- d) applying a high flash-point penetrating oil such as light diesel to the gap between the shell and the bottom, letting stand for at least four hours, and examining the weld for evidence of wicking.

NOTE Residual oil may remain on the surfaces yet to be welded even after the cleaning required below and contamination of the subsequent weld is possible

- e) Applying a bubble-forming solution to the weld, using a right-angle vacuum box, and examining for bubbles.

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Thoroughly clean all residual examination materials from the as yet to be welded surfaces and from the unwelded gap between the shell and bottom. Remove defective weld segments and reweld as required. Reexamine the repaired welds and a minimum of 150 mm (6 in.) to either side in the manner described above. Repeat this clean-remove repair-examine-and-clean process until there is no evidence of leaking. Complete all welding passes of the joint both inside and outside the shell. Visually examine the finished weld surfaces of the joint both inside and outside the shell for their entire circumference.

6.4 REPAIR

When there is some leakage on the weld, the leakages on the weld shall be marked and repaired by welding as per approved main WPS. After completed repaired by welding the area weld have been repaired shall be cleaned before examined by the same test method, When the defect was detected. if leakage on weld found by oil leak test, the treatment for repairing as follow:

- 3.1.1 Mark the leak area using a permanent marker.
- 3.1.2 Clean the area from oil, dirt, etc. using a rag below by air to make sure the leak area is clean and dry.
- 3.1.3 Remove the leak area using grinder.
- 3.1.4 Clean the removed area by grinding or power brush.
- 3.1.5 Re-welded using the same electrode as originally used according to approved main WPS and by certified welder.
Make sure before re-weld the defect area to be clear.
- 3.1.6 After visual inspection

6.5 RE-EXAMINATION OF REPAIR AREAS:

Repaired areas shall be re-examined by the Oil Leak Test method examination that were originally required for the affected area.

6.6 POST CLEANING:

After completion, clean the surface on which the oil was applied using hand brush, blow by air and/or clean rag.

| | | | | | | | | | |
|--|--|-----------|-----------|---------|------|----------|-------|---|------|
|  NISOC | <p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض</p> <p>خرید مخازن ذخیره ایستگاه تقویت فشار گاز بینک (قرارداد BK-HD-GCS-CO-0026_00)</p> | | | | | | |  | |
| شماره پیمان: ۰۵۳ - ۰۷۳ - ۹۱۸۴ | VACUUM & OIL LEAK TEST PROCEDURE | | | | | | | شماره صفحه : 11 از 13 | |
| | پروژه | بسته کاری | صادرکننده | تسهیلات | رشته | نوع مدرک | سریال | | نسخه |
| | BK | GCS | IDR | 120 | QC | PR | 0006 | | V00 |

6.7 REPORT

After completion of Oil Leak Test iDrill Middle East inspector will prepare the Report of Oil Leak Test for Purchaser approval.




7 SAFETY

Safety shall be followed as per HSE specification during test.

8 ATTACHMENTS:

| | | | | | | | | | |
|---|--|-------|-----------|------------|---------|------|----------|---|--|
|  | <p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض</p> <p>خرید مخازن ذخیره ایستگاه تقویت فشار گاز بینک (قرارداد BK-HD-GCS-CO-0026_00)</p> | | | | | | |   | |
| | VACUUM & OIL LEAK TEST PROCEDURE | | | | | | | شماره صفحه : 12 از 13 | |
| | شماره پیمان: | پروژه | بسته کاری | صادر کننده | تسهیلات | رشته | نوع مدرک | | |
| ۰۵۳ - ۰۷۳ - ۹۱۸۴ | BK | GCS | IDR | 120 | QC | PR | 0006 | V00 | |

8.1 VACUUM TEST REPORT FORM. (ATTACHMENT #1)

| | | | | |
|---|---|--|-------------------------------------|---|
|  | Project Name: Binak Oilfield Development of Gas Dehydration Package. | | |   |
| | VACUUM TEST REPORT | | | |
| Client: NISOC | Vendor: iDrill Middle East | Purchaser: Hirgan Energy – Design & Inspection Companies | Date: | |
| P.O. No.: | Procedure No.: | Report No.: | Page No.: Page 1 of 1 | |




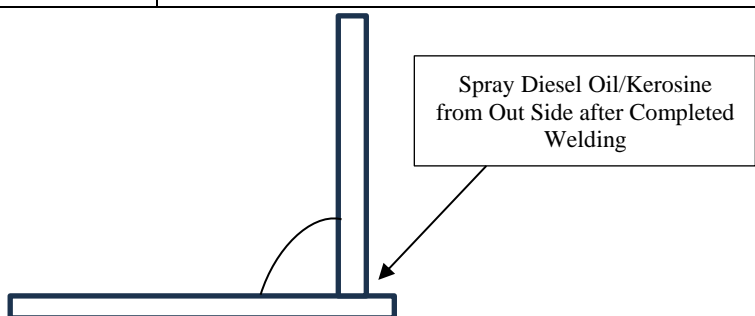
| | | | |
|----------------------------------|-----------------------|-------------------------------|----------------------|
| Tank No.: | Test Solution: | Test Vacuum: | Holding Time: |
| Gauge Identification No.: | Gauge Range: | Gauge Calibration No.: | Test Medium: |

| Row | Weld Joint No. | THK mm | Weld Type | Observation | Evaluation | Location | Acc/Rej |
|-----|----------------|--------|-----------|-------------|------------|----------|---------|
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| | | | | |
|--------------------|--------------------|--------------|------------|--------------|
| IDRILL M. E | HIRGAN / DI | PEDCO | TPI | NISOC |
| Name: | Name: | Name: | Name: | Name: |
| Date: | Date: | Date: | Date: | Date: |
| Signature: | Signature: | Signature: | Signature: | Signature: |

| | | | | | | | | | |
|---|--|-------|-----------|------------|---------|------|----------|---|--|
|  | <p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض</p> <p>خرید مخازن ذخیره ایستگاه تقویت فشار گاز بینک (قرارداد BK-HD-GCS-CO-0026_00)</p> | | | | | | |   | |
| | VACUUM & OIL LEAK TEST PROCEDURE | | | | | | | شماره صفحه : 13 از 13 | |
| | شماره پیمان: | پروژه | بسته کاری | صادر کننده | تسهیلات | رشته | نوع مدرک | | |
| ۰۵۳ - ۰۷۳ - ۹۱۸۴ | BK | GCS | IDR | 120 | QC | PR | 0006 | V00 | |

8.2 OIL LEAK TEST REPORT FORM. (ATTACHMENT #2)

| | | | | |
|---|--|---|-------------|---|
|  | Project Name: Binak Oilfield Development of Gas Dehydration Package. | | |   |
| | OIL LEAK TEST REPORT | | | |
| Client: | Vendor: | Purchaser: | Date: | |
| NISOC | iDrill Middle East | Hirgan Energy – Design & Inspection Companies | | |
| P.O. No.: | Procedure No.: | Report No.: | Page No.: | |
| | | | Page 1 of 1 | |
| Tank No.: | | | | |
| Date of Inspection: | | | | |
| Location / Area: | | | | |
| Oil Properties | Type: | | | |
| | Method of Application: | | | |
| | Temperature: | | | |
| | Holding Time: | | | |
| Test Location |  | | | |
| Test Result | <input type="checkbox"/> Accept <input type="checkbox"/> Reject | | | |

| | | | | |
|-------------|-------------|------------|------------|------------|
| IDRILL M. E | HIRGAN / DI | PEDCO | TPI | NISOC |
| Name: | Name: | Name: | Name: | Name: |
| Date: | Date: | Date: | Date: | Date: |
| Signature: | Signature: | Signature: | Signature: | Signature: |