

**ASSIUT HYDROCRACKING COMPLEX (AHC)  
ANOPC**



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**EQUIPMENT NOISE CONTROL  
SPECIFICATION**

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## ASSIUT HYDROCRACKING COMPLEX (AHC) ANOPC

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### 1. SCOPE

This specification prescribes noise levels that shall be guaranteed by the equipment Vendors and noise information to be supplied by Vendors as part of the requisition.

The noise levels are based on the requirement indicated on the project document "Plant Noise Control Specification" coded as 079254C-0000-JSD-6000-01.

### 2. CODES AND STANDARDS

The following codes and standards, to the extent specified herein, form a part of this specification. When an edition date is not indicated for a code or standard, the latest edition shall apply.

#### a. Laws and Codes:

- [1] Law **No. 4** of 1994 amended by Law **No. 9** of 2009 and Law 105 of 2015 and its Executive Regulations (ER) issued by the Prime Minister's Decree **No. 338** of the 1995 amended by Prime Minister's Decree **No. 710** of 2012 and Prime Minister's Decree **No. 618** of 2017.
- [2] IFC EHS General Guidelines (April 30, 2007)

#### b. Criteria and Procedures:

Engineering Equipment and Materials Users Association – EEMUA

- [3] EEMUA 140: Noise Procedure Specification
- [4] EEMUA 141: Guide to the Use of EEMUA 140

#### c. Measuring Instruments will be in Accordance with:

International Electrical Commission – IEC

- [5] IEC 61672: Sound Level Meters, Part 1 & 2
- [6] IEC 60225: Octave, Half – Octave and Third – Octave Band Filters Intended for the Analysis of Sound and Vibrations
- [7] IEC 60942: Sound Level Calibrators

#### d. Measuring methods will be in accordance with:

International Standard Organization – ISO

- [8] ISO 9612: Acoustics – Determination of Occupational Noise Exposure Engineering Method
- [9] ISO 1996: Acoustics – Description, Measurement and Assessment of Environmental Noise, Part 1 & 2.
- [10] ISO 3740: Determination of Sound Power Levels of Noise Sources
- [11] ISO 4871: Declaration and Verification of Noise Emission Value of Machinery and Equipment

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- [12] ISO 9614: Acoustics – Determination of Sound Power Levels of Noise Sources using Sound Intensity
- [13] ISO 11200: Noise Emitted by Machinery and Equipment.

### 3. DEFINITIONS

The following terms as used in this specification shall have the meanings denoted:

**Noise:**

Any unwanted sound which can produce, at least potentially, undesirable effects or reactions in humans.

**Noise Level:**

The sound level or sound pressure level of a sound which is categorized as noise.

**Sound Pressure Level (SPL):**

The sound pressure level is an indication of the loudness of a noise and it is the quantity measured by sound level meters. The sound pressure level is expressed in decibels (dB) and is defined as follows:

$$SPL = 20 * \log_{10} \frac{P}{P_0}$$

Where:

SPL = Sound Pressure Level (dB)

P<sub>0</sub> = Reference Sound Pressure, 2\*10<sup>-5</sup> N/m<sup>2</sup> (1 N/m<sup>2</sup> = 1 Pa)

P = Sound Pressure (N/m<sup>2</sup>)

**Sound Power:**

The sound power is a measure of the acoustic power, measured in watts and emitted by a source.

**Sound Power Level (PWL):**

The sound power level is expressed in decibels (dB) and is defined as follows:

$$PWL = 20 * \log_{10} \frac{W}{W_0}$$

Where:

PWL = Sound Power Level (dB)

W<sub>0</sub> = Reference Sound Power, 10<sup>-12</sup> W

W = Sound Power (W)

**Sound Level:**

The sound pressure level when frequency-weighted according to the standardized A or C reference scales used in sound-level meters.

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### **dB(A):**

The sound level which is measured on the A-weighted scale of a sound-level meter. The A-weighted scale represents closely the sensibility of the human ear.

### **Band Level:**

The sound pressure level in a particular frequency band, for example, the 500 Hz octave band level.

### **Octave Band:**

A range of frequencies whose upper band limit frequency is nominally twice the lower band limit frequency. The following eight octave bands are usually adequate for plant noise study: 63, 125, 250, 500, 1000, 2000, 4000 and 8000 Hz.

### **Narrow Band Noise:**

When the noise from a source contains a pure tone or narrow band component which is a noticeable to ear as a noise of distinguishable pitch, and which represents a dominant feature of the total source noise, then the source noise shall be regarded as containing narrow band noise for the purpose of this specification.

### **Background Noise:**

The noise without a particular source of emission.

### **Impulsive Noise:**

When a noise contains significant irregularities, such as bang, clanks, or thumps, or if the noise is only existent momentarily and is of a character to attract attention, the it shall be considered as impulsive for the purpose of this specification.

### **Work Area:**

The work area is defined as any position greater than 1 m from equipment surface (including piping systems) accessible to personnel, or any position where a person's ear may be exposed to noise, during normal work activities up to 8 h/day.

### **Restricted Area:**

Restricted areas are those areas in the plant where it is not reasonably possible to reduce the noise level below the work area limit. In those areas, the presence of operators without hearing protection shall be maximum 2 h/day.

## 4. PERMISSIBLE NOISE LEVELS FOR EQUIPMENT

In order to meet the requirements for the plant overall noise, the noise generated by each piece of equipment shall not exceed the levels indicated below.

Table 1 – Permissible Noise Levels for Equipment								
SPL (dB(A))	SPL (dB Ref. $2 \cdot 10^{-5}$ N/m <sup>2</sup> ) Octave band Center Frequency (HZ)							
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
85	99	92	86	83	80	78	76	74

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In such particular case, equipment noise value can be exceed taking into account that noise area value shall be respected.

The noise levels for equipment shown above, are in terms of dB(A) and the individual octave band SPL. Neither the dB(A) level nor any octave band levels shall be exceeded.

The noise level shown in table presented above is under rated operating conditions. If the noise test is performed under no-load conditions, the permissible noise level shall be reduced by 3 dB(A). If the noise is concentrated in a narrow band, the permissible SPL shall be reduced by 5 dB.

Locations for measuring the noise levels of equipment installations are given below.

Selection of all equipment should be based on noise reduced type.

It is possible to exceed the maximum noise level shown above, if the equipment are segregated into proper building; or if area noise limit surrounding the equipment is in compliance with the project document "Plant Noise Control Specification" 079254C-0000-JSD-6000-01.

**Table 2 – Equipment Noise Measurement Location**

N°	Equipment Grade and	Measurement Location
1	Pumps	The noise level shall be measured at a horizontal distance of 1 m from the equipment surface and accessories and at a height of 1.5 m above the equipment base
2	Centrifugal Compressors	The noise level shall be measured at a horizontal distance of 1 m from the equipment surface and at a height of 1.5 m aboveground.
3	Reciprocating Compressors	The noise level shall be measured at a horizontal distance of 1 m from the equipment surface and at a height of 1.5 m aboveground.
4	Fans and Blowers	The noise level shall be measured at 1 m from the casing and also 1 m from the inlet and discharge duct wall, at a height of 1.5 m above the equipment base. In addition, 1 m from the inlet or discharge when open to atmosphere.
5	Electrical Motors	The noise level shall be measured at a horizontal distance of 1 m from the equipment surface and accessories and at a height of 1.5 m above the equipment base.
6	Steam Turbines	The noise level shall be measured at a horizontal distance of 1 m from the equipment surface and at a height of 1.5 m aboveground.
7	Vent Silencers	The noise level shall be measured 1 m from the nearest service platform or worker exposure location at a height of 1.5 m above the platform or grade.
8	Fired Heaters	The noise level shall be measured 1 m from perimeter wall and 1.5 m aboveground.
9	Control Valves	The noise level shall be measured 1 m downstream of the valve and 1m from the pipe.
10	Miscellaneous Noisy Equipment	The noise level shall be measured: a) at a horizontal distance of 1 m from all major surfaces of the equipment and at a height of 1.5 m from the base of

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Table 2 – Equipment Noise Measurement Location

		the equipment and at height of 1.5 m above any operating platform. b) If the supplier provides an acoustical enclosure or other noise reduction treatment, the guaranteed noise levels must be met at a distance of 1 m from any and all surfaces of the enclosure treatment.
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### 5. SUPPLIER REQUIREMENTS

#### 5.1. Noise Data

In the offer, the Supplier shall indicate the following:

- Maximum guaranteed total noise level (SPL) of the equipment, in the requested measurement points, without acoustic treatment.
- Extra cost for acoustic treatment in order to achieve the specified noise limit or the minimum technical feasible guaranteed noise level.

If the standard design does not meet the specified noise limits, alternatives for a special design, or acoustical treatment of the standard design, shall be described and cost impacts shall be quoted in the vendor's proposal. Any effects on performance or operation of the equipment shall be clearly noted.

Two (2) months after the order (telex or intent) Supplier shall submit full noise data for approval. This noise levels shall be reported on the "Data Sheet for Noise Source", including, as minimum, the following information:

- Description of equipment item (s) and item (s) number (s).
- Specified sound pressure level and sound power level for each octave band frequency without acoustic treatment.
- Expected or measured sound pressure level and sound power level for each octave band frequency.
- Narrow-band or impulsive noise component.

The order of preference for obtaining the required noise data is as follows:

- From test (shop test).
- From noise data obtained by test on similar equipment and corrected for the actual equipment size and operating conditions.
- From calculation by theoretical or empirical techniques.

#### 5.2. Equipment Noise Testing

Where practicable, the noisy equipment requires a shop noise test. Shop noise test shall be conducted at the normal service duty conditions.

Where a shop noise test is not feasible, a field test shall be carried out.





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**5.3. Guarantee**

The supplier shall guarantee in writing that his equipment, installed and operating under design load, will not produce noise levels exceeding the requirements of this specification. If the noise test (shop test or field test) indicates that an equipment is producing noise levels exceeding the guaranteed ones, the Supplier will be responsible for the extra cost for treating the equipment to reduce the noise levels within the specification requirements.

Remedial work shall be subject to the following conditions:

- Process performance guarantees shall not be affected.
- Operation life shall not be affected.
- The materials for corrective actions will be made available at field at a time designated by the purchaser.

**5.4. Equipment Design**

When acoustical enclosures are required, the supplier shall perform the enclosure design to insure that the following features are incorporated:

- Capability of operating valves.
- Visibility of instruments and gauges.
- Capability of making mechanical adjustment on the equipment.
- Ease of disassembly and re-assembly the enclosure for major equipment maintenance.