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KLM Technology Group #03-12 Block Aronia, Jalan Sri Perkasa 2 Taman Tampoi Utama 81200 Johor Bahru Malaysia	<b>PERFORMANCE GUARANTEE</b>  <b>(PROJECT STANDARDS AND SPECIFICATIONS)</b>	

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## SCOPE

This Project Standards and Specification sets forth the content and the extent of the performance guarantee concerning processes and equipment as well as product's quality and quantity. The requirements outlined herein are supplementary to the guarantees listed on the individual job specification/duty specification/data sheet.

## REFERENCES

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

### 1. ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)

- Test Method ASTM D-86
- Test Method ASTM D-93
- Test Method ASTM D-1160
- Test Method ASTM D-323
- Test Method ASTM D-156
- Test Method ASTM D-1500
- Test Method ASTM D-155
- Test Method ASTM D-130
- Test Method ASTM D-97
- Test Method ASTM D-976
- Test Method ASTM D-189
- Test Method ASTM D-2500
- Test Method ASTM D-2709
- Test Method ASTM D-1522
- Test Method ASTM D-2163
- Test Method ASTM D-2420

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- Test Method ASTM D-70
- Test Method ASTM D-5
- Test Method ASTM D-36
- Test Method ASTM D-113
- Test Method ASTM D-6
- Test Method ASTM D-92
- Test Method ASTM D-4
- Test Method ASTM D-445
- Test Method ASTM D-2788
- Test Method ASTM D-1522

## 2. API (AMERICAN PETROLEUM INSTITUTE)

"API Technical Data Book", Petroleum Refining, 4th. Ed., Copyright 1983

### DEFINITIONS AND TERMINOLOGY

**Contractor** - The persons, firm or company whose tender has been accepted by the Employer and includes the Contractor's personnel representative, successors and permitted assigns.

**Defects** - All items, which require replacement or repair but could not have been replaced or repaired before take over and in no way hinder or affect the requirements for substantial completion.

**Engineer** - The Employer's representative appointed by the Employer from time to time to supervise execution of the project.

**Licensor(s)** - Licensor means a company duly organized and existing under the laws of said company's country and as referred to in the preamble to the contract.

**Provisional Acceptance** - Operability test has been satisfactorily completed with the system operating at the capacity as defined in the contract for a continuous period as defined. Substantial completion shall be evidenced by issuance of a Provisional Acceptance Certificate per contract.

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**Specifications** - Drawings, specifications, bills of materials and any other technical documents, whatever they may be, issued with the contract documents including any revisions or additions from time to time to the drawings, specifications, bill of material and any other technical documents.

**Sub-Contractor** - Any person, firm or company (other than Contractor) named in the contract for any part of the works or any person to whom any part of the contract has been sub-let with the consent in writing of the Engineer and the legal personal representatives, successors and assigns of such person.

**Unit or Units** - One or all Units and facilities as applicable, to form a complete operable oil and/or gas refinery and a petrochemical complex and/or distribution depot as defined in the scope of work of the contract except those items listed in the scope of work as to be designed and constructed by others.

**Writing** - Any manuscript type written or printed statement under seal or hand.

## **SYMBOLS AND ABBREVIATIONS**

<u><b>SYMBOL/ABBREVIATION</b></u>	<u><b>DESCRIPTION</b></u>
A/D	Analog/Digital.
API	American Petroleum Institute.
ASTM	American Society for Testing and Materials.
bb1/sd	Barrels Per Stream Day.
BL	Battery Limit.
BOD	Biological Oxygen Demand.
CCR	Continuous Catalyst Regeneration
COD	Chemical Oxygen Demand.
DAF	Dissolved Air Flotation.
DCS	Distributed Control System.
EP	End Point.
Eq	Equation.
FBP	Final Boiling Point.
FI	Flow Indicator.
FIC	Flow Indicator Controller.
FP	Flash Point.
FQ	Fow Totalizer.
HPS	High Pressure Steam.
IP	The Institute of Petroleum.
LPS	Low Pressure Steam.
mass ppm	Parts per million by mass, (mg/kg).

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MCR	Maximum Continuous Rating.
MPS	Medium Pressure Steam.
NFPA	National Fire Protection Association.
Nm <sup>3</sup>	Normal cubic meters, (at 101.325 kPa and 0°C conditions).
NPSH	Net Pressure Suction Head.
PSA	Pressure Swing Adsorption.
RVP	Reid Vapor Pressure.
Sm <sup>3</sup> /d	Standard cubic meters per day (at 101.325 kPa and 15°C conditions).
T/D	Turn Down.
TDS	Total Dissolved Solids.
WWT	Waste Water Treatment.

## UNITS

This Standard is based on International System of Units (SI) except where otherwise specified.

## GUARANTEE ITEMS AND FIGURES

The performance guarantee is classified into the following three categories:

1. Process performance guarantee.
2. Utility guarantee.
3. Equipment guarantee.
4. Environment Related Guarantee.

### Process Performance Guarantee

The Contractor shall guarantee that when each non-licensed Unit or facility is operated during a performance test in accordance with the designed conditions, the facility constructed will be capable of producing the designed guaranteed quantity and quality of product.

The Contractor shall guarantee that when non-licensed process or Utility Units are correctly operated at their respective design feed rates it will not be necessary to operate pumps or compressors installed as spares simultaneously with the normally operating equipment in the Units or in Offsite Units.

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The Contractor shall guarantee that the basic and detailed design work (except design made by Licensers) which is performed for all Units and facilities will be such that the lines, control valves, relief valves and instrumentation and all other parts of the plant shall be capable of handling the quantities specified in the process design.

The items and figures pertaining to process performance guarantee are listed in Appendix A as typical for a refinery. Process performance test runs, which may be conducted independently or simultaneously with other units, are to be conducted to compare and confirm their performance with the guarantees of respective process. The items and figures applicable to the performance guarantee of utility systems is listed in Appendix B as typical for a refinery.

1. Plant capacity

The plant shall process 100% of the design basis charge; the turn down ratio specified in the design basis shall also be guaranteed.

2. Product yield

It shall be guaranteed that the plant will produce 100% of the design basis products.

3. Product specifications

It shall be guaranteed that the plant will produce the products with the specifications indicated in the design basis. All the products guarantees are based on the relevant feed characteristics/compositions presented in original contract documents.

In case that discrepancies appear at the time of the performance test run, necessary adjustments shall be made to the guaranteed figures upon agreement between the two parties (Contractor and Company) in accordance with actual feed characteristics.

4. Raw material

In the case of chemical plants designed to synthesize chemical products, there shall be a guarantee with regard to the quantity of synthesized products and the quantity of required raw materials. This means that it is necessary to guarantee the selectivity in terms of yields of reaction, which is closely associated with catalyst performance and catalyst life. In such cases a guarantee figure of 105% (as maximum) of raw material with respect to the design basis can be considered.

5. Catalyst performance and life

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Since the performance and life of a catalyst are factors that may influence process performance to a large extent, for cases where the Contractor develops process and provides catalyst and offers them to the Company, the Contractor and/or the catalyst manufacturer shall guarantee the performance and life of the catalyst. Aside from above-mentioned cases, Licensor and/or the catalyst manufacturer shall guarantee the performance and life of the catalyst.

#### 6. Chemical consumption

Chemical consumption is also a factor that may influence process performance to a large extent and it is sometimes related to the performance of a catalyst. It can be guaranteed that 105% by mass (as maximum) of chemical with respect to the design basis will be consumed.

### Utility Consumption Guarantee

#### 1. Guarantee items

Utility requirement may vary depending upon the process, the scope of the Contractor's work and many other factors.

The guaranteed utility consumption items will generally consist of:

- Steam [High Pressure Steam (HPS), Medium Pressure Steam (MPS) and Low Pressure Steam (LPS)].
- Electrical power.
- Fuel (fuel gas or fuel oil).
- Cooling water.

#### 2. Guarantee figure

Utility consumption of a Unit means the imported utilities from other Unit(s). The guaranteed figure should be the average utility consumption of continuously operating equipment. These data are at the design throughput of the Unit (utilities required for lighting, ventilation, air conditioning and instrumentation are not included in the consumption). Guaranteed figures of utility consumption for summer condition and winter condition shall be developed with the understanding that one or the other will be demonstrated during the performance test run depending upon the period during which the test will be carried out.

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The utility consumption tests for the performance guarantee will consist of the following two tests:

a. Process Unit

The utility consumption of each process Unit at its design capacity is observed during the process performance test. The Units subject to utility consumption guarantee are those mentioned in contract documents.

In the case of licensed processes, Licensers will not usually guarantee utility consumption of a process plant.

Accordingly, the Contractor must make allowance for heat loss and utility consumption, which must be calculated by himself. Regarding guarantee figures for utility consumption, 5% over and above the calculated values, which include the heat losses, is allowed.

b. Utility and Offsite Units

After the performance/utility consumption guarantee test of all process Units, utility consumption (for the Utility Units and the Offsite Units) shall be checked at the contractual capacity of the whole complex at an operation mode in accordance with the complex block flow diagram.

In the event that the Contractor fails to meet the combined total daily cost guaranteed for the consumption of fuel, electric power and steam in the Unit or Units set out in the contract, the Employer accepts a financial settlement in lieu of corrective measures in the event of failure to meet guarantee. Such settlement shall be the amount by which the cost of the utilities based on the consumption determined from the performance test exceeds the guaranteed daily cost both calculated for a period of 1000 days and valued in accordance with the actual costs.

**Equipment Guarantee**

Equipment guarantee shall be specified individually in the relevant equipment specification.

**Environment Related Guarantee**

Due consideration must also be given to air pollution, noise control, waste water control and other environment related control measures which are regulated by laws, regulations, national standards, etc.

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## **EXECUTION OF THE PERFORMANCE GUARANTEE TEST**

### **Preparation and Preconditions for Test Operation**

The following preparations must be made to carry out a performance guarantee test:

1. It shall be checked that the plant employs catalysts and chemicals supplied or approved by the Contractor/ Company and that such catalysts and chemicals are available in sufficient quantities to conduct the test operation.
2. It shall be checked that the plant employs feedstocks, raw materials and utilities meeting the specifications set forth in the design basis and that such feedstocks, raw materials and utilities are available in sufficient quantities to conduct the test operation.
3. It shall be confirmed that the plant has been constructed in accordance with the specifications, drawings and other data furnished by the Contractor/approved by the Company.
4. It shall be confirmed that the plant is operated and maintained in accordance with the operation manual furnished by the Contractor/approved by the Company.
5. If it is recognized that exact duplication of design data is improbable under test conditions, operating data obtained during the test operation shall serve therefore as the basis for processing calculations using established and reputable factors and methods. The results obtained in these calculations shall be converted to those which would have been obtained if test conditions had duplicated the design conditions.
6. The Contractor must prepare test data sheets/log sheets for Company's review. Necessary services such as adequate laboratory testing services, inspection, operating and maintenance personnel and product evacuation, etc. shall be furnished by the Company. The Contractor may witness such laboratory tests.
7. After the start of the initial operation and before commencing the test operation, the instruments required for the performance guarantees which would seem to have wrong indication shall be calibrated.
8. Before commencing the performance test, adjustment of operating conditions of the Unit may be required by Contractor to gain a prospect of which the performance guarantees would be met.

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9. Miscellaneous preparatory works shall have been completed such as:
- confirmation of data logging and reading system;
  - confirmation of sampling and analysis system;
  - confirmation of data collection of electric power consumption.

### **Measuring Schedule**

1. Data collection

Operating data to be used for the calculation of the performance guarantee shall be measured by means of instruments provided on the plant and collected by the following method:

- a. Shift report printed out on the DCS report printer three times a day (8:00,16:00,24:00).
- b. Reading or printing out the data of the tank gaging system every four hours. Tank level measurement shall be adopted as a reference unless otherwise specified, because it is difficult to collect correct data due to erroneous information caused by level fluctuation during tank change and time difference at data collection. Notwithstanding the above when level measurement of a tank is applied, the tank tables shall be made available beforehand.
- c. Reading of the local data every four hours. If some hunting on the indicators is found, the averaged value shall be taken for recording.

2. Measurement of electric power consumption

The electric power consumption shall be measured by reading the total watt-hour meters in the substation, each ampere and volt of running equipment with ampere-meters or clamp-meters and voltmeters, as necessary. Reference shall also be made to the respective measuring schedule of detailed performance test of the Units (to be developed by the Contractor).

### **Product Sampling and Laboratory Test Schedule**

1. General

Procedures described in this Clause are typical and may be modified in accordance with the discussion between Company and Contractor, according to actual situations and conditions of the parties.

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2. Line sampling for liquid

Samples shall be taken three liters per each sampling time and one sample point every eight (8) hours and be used for the following purposes:

- a. One liter to be used for laboratory analysis, the analysis frequency of which is once per eight hours.
- b. One liter to be used for making one day composite sample which is a mixture of 3 samples per day and be used for laboratory analysis, the analysis frequency of which is once per day.
- c. One liter to be stored for the use of further analysis, which might be carried out (such sample is referred to as "retained sample").

3. Line sampling for gas and LPG

Samples shall be taken one balloon or one bomb per point every eight hours. No retained sample is required.

4. Tank sampling (if applicable)

a. Tank sampling (if applicable)

Samples shall be taken as two liters per point using a sampler at three points in a tank, i.e., upper, middle and lower levels and be used for the following purposes:

- One liter of each point to be used for making a mixture of upper, middle and lower point samples. The mixed sample is to be used for all laboratory analysis required.
- The rest (one liter each) to be stored as retained sample.

b. Samples shall be taken two liters per point at the sample connection on the tank (if provided) and one liter is to be used for all laboratory analysis required and the rest (one liter) is to be stored as a retained sample.

5. Laboratory test schedule

Reference shall be made to the respective sampling and laboratory test schedule of the detail procedure of each Units (to be developed by the Contractor).

6. Test equipment

The Company shall provide all test equipment required for the laboratory analysis.