

PERFORMANCE GUARANTEE**JGS 210-120-1-14E**

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1. SCOPE

This standard practice covers the extent and the contents of the Performance Guarantee mainly for processing plant. The performance guarantee of a packaged unit, such as boiler, shall be discussed separately.

2. TYPE OF GUARANTEE

Specification for Performance Guarantee shall be prepared, clarifying the following items, and shall be clearly documented in the guarantee agreement(s) as a part of Contract(s) among the related parties.

(1) Type of Contract with Client for Project Implementation and JGC's Scope of Work

(2) Scope and Responsibility of Process Licensor

(3) Scope and Responsibility of Subcontractor(s) and Vendor(s)

Based on the contractual formation and obligation, each party is responsible for the work which he performs.

However, when JGC is the prime Contractor for the EPC project implementation upto the plant mechanical completion, there are typically two cases for JGC's responsibility regarding the plant performance to the Client.

Case-1 : JGC is solely responsible for the entire plant performance.

Case-2 : Process licensor or engineering company, who conducted process design and basic design, provides the guarantee of the plant process performance directly to the Client and JGC assumes responsibility for the remaining performance guarantees including utility and mechanical guarantee.

In both of the above two cases however, JGC is usually obliged to guarantee the plant capacity in terms of distillation, thermal and hydraulic capabilities so that the plant can process the design amount of feedstock at the design operating conditions and yield the product at the specified battery limit conditions.

This is because JGC finalizes and realizes these capabilities through E (detailed design)/P/C performance by verifying design of the distillation column internals, rating exchangers and furnaces and confirming hydraulic balances based on the final lay-out, with or without assistance from the selected vendors.

When the plant consists of multiple units, JGC guarantees the performance of each unit respectively and/or guarantees the entire complex performance, which is to be decided based on the contractual requirement.

3. GUARANTEE ITEMS AND FIGURES

The Performance Guarantee is classified into the following categories.

(1) Process Performance Guarantee

(2) Utility Consumption/Generation Guarantee

(3) Mechanical Guarantee

3.1 Process Performance Guarantee**3.1.1 Capacity**

Generally 100% design load operation (Feed Capacity base unless otherwise specified) shall be guaranteed.

Occasionally Maximum Capacity rather than normal may be requested to be guaranteed.

3.1.2 Product Quality (Specification) (*)

Product means whole plant's product, not each equipment's product. Guaranteed quality is usually inferior to the expected quality. The Expected quality may be set forth in the design basis document apart from the Guaranteed quality. One or some of the following aspects of Quality shall be clearly specified.

- Yield (**) (Usually 90~99% of design figure is to be guaranteed)

- Specified component Purity

- Specified component Recovery Ratio (***)

- Specified component Impurity (Usually maximum allowable requirement specified)

- Fluid Properties (RVP, FLASH POINT, ACID NUMBER, ...)

Note: (*) A margin of the product's specification should be applied for the guarantee figures. Therefore the guarantee figures should be decided prior to final issuance of the design basis (margin included).

- (**) Occasionally the Client requests to Contractor guarantee physical properties of a product, which are in principle related to feedstock properties which the plant performance cannot alter. Such items shall be carefully studied in order not to undertake excessive obligation as the Contractor.
- (***) Concerning Recovery Ratio, it should be better indicated on a composition basis to avoid imbalance of flow rate due to time-delay of flow measurement.
For example,

$$\text{Specified component recovery ratio} = \frac{X_p}{X_c} \left(\frac{X_c - X_w}{X_p - X_w} \right)$$

Where

X_c = % of Specified Component in Charge
 X_p = % of Specified Component in Product
 X_w = % of Specified Component in Waste

3.1.3 Distillation Capacity

Generally 90% of the design yield per each cut range should be guaranteed if requested.

3.1.4 Solvent, Make-up Gas, Specific Chemical Consumption

Maximum Consumption or Loss (105~110% of net expected) should be guaranteed if requested.

3.1.5 Catalyst Life

Maximum operable Life (years) before 1st Regeneration should be guaranteed if requested.

3.1.6 Product Rundown

It shall be guaranteed that all product streams have sufficient pressure to be sent to the designated units at the BL conditions specified in the BEDD or Design Basis.

3.1.7 Turn Down

Turn down capacity (usually 30~70% of normal capacity) shall be guaranteed if requested.

Caution should be taken on the following items (Check points) to maintain operability in Turn down condition.

- Tower internal (Weeping, lower limit of Distributor)
- Flow Meter (Out of Range)
- Control Valve (Out of Control, Noise)
- Pump (Minimum Flow)
- H/E (Freezing, Water Hammer, Superheat, etc.)
- Reactor (Scale Effect, Maldistribution)

3.1.8 Hydraulic and Thermal Performance

The total unit shall be operable hydraulically and thermally in accordance with the design intent in order to attain the process performance.

However, the guarantee shall not be provided on each equipment basis, except that heater firing efficiency is often to be guaranteed.

3.1.9 Environment

Air pollution, Noise control, Waste water control and other specific control shall be guaranteed according to Laws, Regulations, National Standards and Project Specification.

3.1.10 Heat Recovery

Regarding Heat Recovery, Saved amounts of Steam consumption/Generation, Coolant (Chiller), Electricity and Fuel consumption shall mainly be highlighted.

Refer to Sec. 3.2-Utility Guarantee.

3.2 Utility Guarantee

Utility Guarantee will generally consist of the following items which are basically based on 100% Load Operation.

3.2.1 Steam and Condense Consumption/Generation

- Guaranteed Consumption figure should include heat loss and design margin. Since actual consumption value is (NET + Heat loss), Guaranteed Value is $(\text{NET} + \text{Heat loss}) \times (1 + \text{design margin})$.
If heat loss is assumed to be 10% of NET and design margin is 10%, Guaranteed figure is about 20% more than NET value.
- Maximum allowable consumption/Minimum attainable generation rate (ton/hr) per each pressure level should be guaranteed.
- Steam consumption rates are a summation of those of reboiler, turbine and other steam users, on the other hand Steam generation rates are a summation of those from boiler, condensate recovery etc.
- In some cases Boiler Feed Water rate for steam generation may be required to be guaranteed.

3.2.2 Cooling Water

- Cooling Water means Sea Water or Cooling Tower Circulation Water.
- Maximum allowable water rate guaranteed should be generally 5~10% more than design rate.
- Guaranteed value will be compared with summation of actual coolant rate of coolers, condensers and other users.
- For Sea Water intake, water rate of the Header may be guaranteed.

3.2.3 Electricity

- Rotating and Heating equipment consume Electricity.
- Maximum allowable value of electricity guaranteed should be generally 5~10% more than design rated value.

3.2.4 Other Utility

The following are sometimes required to be guaranteed.

- Fuel rate (Oil or/and Gas)
- Air supply rate
- Utility Facilities performance

3.2.5 Offset

In some cases, the Client requests Contractor to guarantee the total aggregate consumption of utility in monetary terms, where each utility consumption can be offset against each other and consumption-generation can also be offset.

3.3 Mechanical Guarantee

Mechanical Guarantee means Mechanical integrity and life performance.

Usually one year after the plant start-up is guaranteed.

3.4 Revamp Case

It is difficult to guarantee the performance of a revamped unit, as many items of equipment, piping and associated instrumentation are re-used, not brand new, and therefore each component's performance is not reliable.

JGC usually guarantees only mechanical performance of new equipment replacing the existing, or when strongly requested JGC guarantees the process performance of a revamped unit, for items similar to new units, on condition that the reused equipment and other facilities would perform as well as if they are completely new ones.