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| Employer  SAKO BRNO A.S.  Project  **High-efficient combined heat and power facility utilizing renewable sources (OHB II - line K1)**  Date  February 2021 |

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| Intended for    Document type    Date |
| Part II.h  Guarantees |



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| Project name | High-efficient combined heat and power facility utilizing renewable sources (OHB II - line K1) |
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# Guarantee, environmental and functional Requirements

The performance and specifications of the Contract Object is specified and determined according to the documents contained in part III, *Scope of Works and Technical Requirements*. The specifications in part III, *Scope of Works and Technical Requirements* shall be fulfilled by the Contractor and form the basis for the performance guarantees of the Line.

Part III, appendix A11, *End of Assembly, Commissioning and Testing* contains the procedures for commissioning and performance Test, ensuring the compliance with the Contractor’s performance guarantees.

The guarantee requirements of the Contract Object shall be fulfilled. Test results cannot be improved by adding test variance or tolerance.

Environmental requirements are considered satisfied if the attained test results meet the minimum limits set. Test results cannot be improved by adding test variance or tolerance, even if tolerances are accepted in the permit.

If the environmental requirements are not fulfilled, the Contract Object shall be rectified according to the Contract. If environmental requirements are not met, this shall be deemed to be a substantial defect according to the Contract.

All requirements, specifications and descriptions in the Contract that are not specifically described as guarantee or environmental requirements are considered as functional requirements. If these functional requirements as described in the Contract are not fulfilled, this is to be considered as a defect and shall be rectified according to the Contract.

# Guarantee Data

| Table 1  General | **Employer’s guarantee requirements** | | **Contractor’s Guarantee** | |  |
| --- | --- | --- | --- | --- | --- |
| Date: | |  |
| Contractor Stamp: | |  |
| Guarantee Parameter | Guarantee | Notes / | Guarantee | Notes / | |
| values / data | References | values / data | References | |
| General guarantee | Min. 2 years | To be stated by Contractor |  |  | |
| Corrosion and erosion guarantee, including lifetime for super heaters | Guarantee for 5 years lifetime to minimum material thickness in EN 12953  Demonstrated duration between superheater replacement: 5 years. | Contractor to provide references |  |  | |
| Lifetime of grate bars 1) | Operating hours until 100% of grate area has been replaced  Min. 4 years | To be stated by Contractor |  |  | |
| Lifetime of membrane walls 2) | Operating hours until first partial replacement of membrane walls | To be stated by Contractor |  |  | |
| Lifetime of refractory | Operating hours until first partial replacement of refractory tiles | To be stated by Contractor |  |  | |
| Lifetime of Inconel (or similar corrosion proof alloy) cladding 3) | Operating hours until first welding of new Inconel cladding | To be stated by Contractor |  |  | |
| Lifetime of bag house filter bags | Min. lifespan of 4 years | To be stated by Contractor |  |  | |
| 1. Replacement of 100 % of the grate area is in this context defined as when the total number of replaced grate bars corresponds to the total number of installed grate bars. 2. First partial replacement of membrane walls is in this context defined as the first event where a part of the membrane wall has to be replaced because the wall thickness does no longer comply with the minimum requirements in the latest issue of EN12952-3. 3. First welding of the cladding is in this context defined as situation when thickness of cladding drop below 0,5 mm. | | | | | |

| Table 2  Availability | **Employer’s guarantee requirements** | | **Contractor’s Guarantee** | |  |
| --- | --- | --- | --- | --- | --- |
| Date: | |  |
| Contractor Stamp: | |  |
| Guarantee Parameter | Guarantee | Notes / | Guarantee | Notes / | |
| values / data | References | values / data | References | |
| Availability of Line | Min. h/Year  8,000 | Defined according to the Contract |  |  | |
| Availability, turbine/generator of the Line | Min. h/Year  8,700 | Defined according to the Contract |  |  | |
| Availability, control and monitoring system of the Line | Min. h/Year  8,755 | Defined according to the Contract |  |  | |
| Availability, continuous emission monitoring station of the Line | Min. h/Year  8,585  Max. 10 days per year with more than 5 invalid ½-hour average values |  |  |  | |
| Continuous period of operation of the Line | Min. h  8,000 | Defined according to the Contract |  |  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Table 3  Environmental Compliance** | **Employer’s environmental requirements for the Line** | | | **Contractor’s Guarantee** |  |
| Date: |  |
| Contractor’s stamp: |  |
| ***Note:*** *All concentrations are referred to dry gas at 11 % O2 at standard conditions (Nm3 at 0° and 101 325 Pa).* | | | | |
| Guarantee Parameter | Unit | ½ h value. 97% / 100%  (IED) | Daily average value  (BREF) | | |
| CO | mg/Nm³ | 100/150 1) | 50 | | |
| TOC | mg/Nm³ | 10/20 | 8 | | |
| Dust | mg/Nm3 | 10/30 | 5 | | |
| HCl | mg/Nm3 | 10/60 | 6 | | |
| HF | mg/Nm3 | 2/4 | <0.8 | | |
| SO2 and SO3   (as SO2) | mg/Nm3 | 50/200 | 30 | | |
| NOX as NO2 | mg/Nm3 | 200/400 | 120 3) | | |
| NH3 | mg/Nm3 | 10/20 2) | 10 | | |
| Hg | mg/Nm3 | 0.02/0.04 2) | 0.02 | | |
| 1) CO “100” as half-hourly average value, “150” as 10-minute average value  2) Defined here, but not stated in IED.  2) Any lower value according to the Contractor's Tender shall apply | | | | | |
| Guarantee Parameter | Unit | Result of short-term spot sampling  (3 samples, each of 1 h at least) | | | |
| Σ Cd and Tl | mg/Nm3 | 0.02 | | | |
| Σ As, Pb, Co, Cr, Cu, Mn, Ni, Sb and V | mg/Nm3 | 0.3 | | | |
| Guarantee Parameter | Unit | Result of short term spot sampling  (2 samples of each of 6-8 h) | | | |
| Dioxins and furans (2,3,7,8-TCDD eq.) | ng/Nm3 | 0.04 | | | |
| **IBA quality  (before any treatment)** | Unit | Guarantee requirements | | | |
| Leaching |  | EU's Council decision of 19/12 - 2002, chapter 2.2.2 for non hazardous waste shall be fulfilled as well as TA Siedlungsabfall Deponieklasse 1 and any Czech Regulation. | | | |
| TOC | % w/w | < 3 | | | |
| Dioxins and furans 2,3,7,8-TCDD eq. (VDI 3499) | ng/kg | < 5 | | | |
| Ignition loss for IBA | % w/w | < 5 | | | |

| Table 4  Other requirements | **Employer’s environmental requirements for the Line** | | **Contractor’s Guarantee** | |  |
| --- | --- | --- | --- | --- | --- |
| Date: | |  |
| Contractor Stamp: | |  |
| Guarantee Parameter | Guarantee | Notes / | Guarantee | Notes / | |
| values / data | References | values / data | References | |
| In any load point of the Line: Retention time of flue gas at temperature above 850°C after last air injection. | Min. 2 sec |  |  |  | |
| Exhaust air from various auxiliary plants of the Line. | Max. dust content 5 mg/Nm3 |  |  |  | |
| Noise from the Line | Environmental requirements according to the Table 1 of appendix A14.3 *Acoustic Noise and Vibrations* | Absolute requirement |  |  | |

| Table 5  Process Guarantees and Data | **Guarantee Values and Process Data to be used for Interpolation**  **Stated by Contractor** | | | | | | | | **Contractor’s Guarantee** Date: | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Note:*** *All correction curves and equations needed for correction of production and consumption is included in the Contract. Specific reference is made to testing procedures described in Appendix A20, Procedure for Guarantees Tests.* | | | | | | | | Contractor  Stamp: | |
| **Guarantee Parameter** | **Unit** | **Guarantee load point according to the capacity diagram/ Boiler load point** | | | | | | | | |
| a) LP1 | b) LP1 | c) LP2 | e)  LP9 | f) LP8 | g)  LP7 | h)  LP6 | | i)  LP5 | |
| **Guarantees, conditions** |  |  |  |  |  |  |  |  | |  | |
| Waste throughput | tonnes/h | 16.5 | 16.5 | 19.5 | 19.5 | 16.5 | 11.6 | 11.6 | | 12.7 | |
| Waste LHV | GJ/ton | 10.0 | 10.0 | 8.5 | 7.0 | 7.0 | 10.0 | 13.0 | | 13.0 | |
| Thermal input | MW | 46 | 46 | 46 | 38 | 32 | 32 | 42 | | 46 | |
| District Heat temperatures (cold return – hot forward)[[1]](#footnote-2) | °C | 69 – 83 | 69 – 90 | 69 – 83 | 69 – 83 | 69 – 83 | 69 – 83 | 69 – 83 | | 69 – 83 | |
| LT-ECO and FGC (option 1)[[2]](#footnote-3) | - | Excluded | Included | Excluded | Excluded | Excluded | Excluded | Excluded | | Excluded | |
| **Weighting for Contractor’s Tender evaluation purpose** |  | Refer to part 0.d *Economic Model* | | | | | | | | | |
| **Output guarantees for the Line** |  |  |  |  |  |  |  |  | |  | |
| Gross power production  (Not subject to guarantee) | kW |  |  |  |  |  |  |  | |  | |
| Net power production[[3]](#footnote-4)  (aux consumption shall be divided into main consumers) | kW |  |  |  |  |  |  |  | |  | |
| Heat production, Turbine condenser (Not subject to guarantee) | kW |  |  |  |  |  |  |  | |  | |
| Heat production, LT-ECO (option 1)2 | kW | NA |  | NA | NA | NA | NA | NA | | NA | |
| Heat production, Heat pump for FGC (option 1)2 | kW | NA |  | NA | NA | NA | NA | NA | | NA | |
| Steam consumption, 11.5 bara steam from Existing facility (option 1)2 | kW | NA |  | NA | NA | NA | NA | NA | | NA | |
| Net power production + Total heat production | kW |  |  |  |  |  |  |  | |  | |
| **Consumption and other guarantees for the Line** |  |  |  |  |  |  |  |  | |  | |
| Water consumption, boiler | m3/h | 1) | NA | NA | NA | NA | NA | NA | | NA | |
| Fresh water consumption, total | m³/h | 1) | NA | NA | NA | NA | NA | NA | | NA | |
| Urea-consumption  (values ref. 100% Urea) | kg/h | 1) | NA | NA | NA | NA | NA | NA | | NA | |
| Quick lime consumption, CaO (values ref. 100% CaO ) | kg/h | 1) | NA | NA | NA | NA | NA | NA | | NA | |
| Hydrated lime consumption, Ca(OH)2  (values ref. 100% Ca(OH)2) | kg/h | 1) | NA | NA | NA | NA | NA | NA | | NA | |
| Activated carbon consumption | kg/h | 1) | NA | NA | NA | NA | NA | NA | | NA | |
| *Consumptions of all other chemicals, shall be specified by Contractor* | kg/h | *ref. to article 3* | NA | NA | NA | NA | NA | NA | | NA | |
| Boiler ash and FGT residue | kg/h | 1) | NA | NA | NA | NA | NA | NA | | NA | |
| Compressed air consumption, service air | Nm3/h | 1) | NA | NA | NA | NA | NA | NA | | NA | |
| Compressed air consumption, instrument air | Nm3/h | 1) | NA | NA | NA | NA | NA | NA | | NA | |
| Live steam temperature  (Assuming 1000 hours of operation) | °C | 400 2) | NA | NA | NA | NA | NA | NA | | NA | |
| Flue gas temperature downstream boiler economiser | °C | 3) | NA | NA | NA | NA | NA | NA | | NA | |
| 1) Maximum value valid at load case shall be provided. 2) Reference is made to associated part of the Contract regarding liquidated damages for reduced live steam temperature.  3) Min. 170°C, nominal 170°C and maximum 190°C (maximum temp is after 8,760 hours operation without manual boiler cleaning). | | | | | | | | | | |

# Others chemicals consumption[[4]](#footnote-5)

Specification of others Contractor’s consumables chemicals for the operation of the Line:

| **Table 6**  **Consumption guarantee**  **Others chemicals consumption** |  | |
| --- | --- | --- |
| **Guarantee Parametr** | **Unit** | **a)**  **LP1** |
| *Chemical 1 … to be stated by Contractor* |  | 1) |
|  |  | 1) |
|  |  | 1) |
|  |  | 1) |
|  |  | 1) |
|  |  | 1) |
|  |  | 1) |
|  |  | 1) |
|  |  | 1) |
|  |  | 1) |
|  |  | 1) |
|  |  | 1) |
|  |  | 1) |
|  |  | 1) |
| 1) Maximum value valid at load case shall be provided. | | |

1. DH temperatures are at DH supply limits of the Line, refer to Appendix A18 *Limits of Supply*. I.e the connection points for the Line to the Employer’s existing DH system. [↑](#footnote-ref-2)
2. Option 1 covers inclusion of a low temperature economizer (LT ECO) and flue gas condensation (FGC) with heat pump located downstream bag-house filter and upstream ID-fan. [↑](#footnote-ref-3)
3. Net power production=Gross power production – process power consumption (All process equipment from hopper to stack, not including waste cranes, and district heating pumps of the Existing facility). [↑](#footnote-ref-4)
4. *Contracting authority add contractual penalties to the part II.c Contractual penalties for non-compliance with values, related to non-compliance of inserted values in relation to the fulfilment of Table 6.* [↑](#footnote-ref-5)