

JSC «SLAVNEFT-YANOS»

APPROVED BY:

General Director

JSC “Slavneft-YANOS”

_____ **A.A. Nikitin**

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TECHNICAL ASSIGNMENTS FOR PREPARING TECHNICAL AND COMMERCIAL PROPOSAL FOR PROCESS SUBMISSION AND BASIC ENGINEERING DESIGN PACKAGE DEVELOPMENT FOR THE PROCESSES OF ACID PROCESS CONDENSATES (SULFIDE CONTAINING EFFLUENTS) REGENERATION

Yaroslavl
2014

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SECTION A – GENERAL INFORMATION

1. INTRODUCTION

Process scheme of JSC “Slavneft-YANOS” includes two process units treating the process effluents generated at the following units of the Refinery:

- sulfuric-caustic effluents neutralization unit (SCENU) aimed at oxidation of sulfide sulfur up to less toxic compounds of thiosulfates and sulfites in the process effluents AVT-3, AVT-4, ELOU-AT-4 (crude oil primary processing units), VT-3 (crude oil vacuum processing unit), MTBE unit and also, if necessary, from 1A-1M (FCC unit), Visbreaking unit, KR-600 (Catalytic Reforming with CCR unit);
- sulfide containing effluents regeneration unit of sulfur production unit (SCERU) is targeted at removal of hydrogen sulfide and ammonia contained in process effluents by means of rectification process.

Sulfuric-caustic effluents neutralization unit (SCENU) was designed for processing the effluents with pH>10 (caustic effluents discharge from straight run naphtha and kerosene alkalization drum) which are not available at present at the Refinery. For promotion of the catalyst used in the reactor column alkali is added to the effluents. Besides, in process of sulfide oxidation nitrogen compounds which are dissolved in water are not subjected to any changes therefore the content of ammonia ions does not decrease after the treatment.

Effluents from hydrocracking, visbreaking, 1A-1M (FCC unit) and hydrotreatment units are processed at SCERU.

Due to commissioning into operation of the new process units the facility capacities of the existing sulfide containing effluents processing units became overloaded. It became necessary to construct additional process units for sulfide containing effluents treatment.

2. DEFINITIONS AND INTERPRETATION OF TERMS

In present Technical Assignment the following standard wordings and expressions shall have the meanings assigned herein to them.

CLIENT shall mean **Open Joint Stock Company “Slavneft-Yaroslavnefteorgsintez” (JSC “SLAVNEFT-YANOS”)** having its office in:

Russia, Yaroslavl, Moskovsky prospect, 130, GKP, 150000

PROJECT shall mean Basic Engineering Design Package for the new process unit of sulfide containing effluents regeneration.

PROCESS means the process of sulfide containing effluents regeneration.

LICENSOR shall mean the qualified Company which is able to perform all SERVICES required for the PROJECT fulfillment and having all the required proprietary rights for the PROCESS.

SCOPE shall mean the scope, extent and limits of all SERVICES to be provided by LICENSOR or CLIENT as described in the present TECHNICAL ASSIGNMENT.

SERVICES shall mean all works to be done and services necessary to be supplied by LICENSOR.

PROPOSAL shall mean the technical and commercial proposal given by LICENSOR to perform all SERVICES and which is prepared and submitted to CLIENT in accordance with the terms of technical and commercial proposal submission.

CLIENT's REPRESENTATIVE shall mean any person appointed by CLIENT to supervise and control the works of LICENSOR during the works execution stages and for performing the duties set by CLIENT.

LICENSOR's REPRESENTATIVE shall mean any person nominated by LICENSOR and approved by CLIENT to perform the duties delegated by LICENSOR.

SECTION B – DESIGN BASIS

The following sections set out the Design Basis to be represented by the LICENSOR. LICENSOR is invited to clearly indicate any additional requirements to the data which are provided in the present Technical Assignment.

LICENSOR shall provide Technical and Commercial Proposal for sulfide containing effluents regeneration unit in compliance with the CLIENT's data.

1. PURPOSE OF THE UNIT

Purpose of sulfide containing effluents regeneration unit:

Processing of sulfide containing effluents with production of stripped water, hydrogen sulfide and ammonia with further ammonia neutralization up to N_2 .

Sulfide containing effluents regeneration shall be performed by means of two-phase rectification process.

2. CAPACITY

Feed capacity of sulfide containing effluents regeneration unit shall be 451 KTPA based on 8 200 operation hours per year.

The operation mode is continuous. The turnaround cycle is 3 years.

3. PRODUCTS SPECIFICATIONS

Stripped water:

Hydrogen sulfide content – max. 11 ppm wt.,

Ammonia content – max. 89 ppm wt.;

Hydrogen sulfide containing gas:

Ammonia content – max. 0.01 % wt.

Ammonia containing gas:

Hydrogen sulfide content – max. 0.01 % wt.

4. FEED SPECIFICATIONS AND COMPOSITION

Sulfide containing effluents.

Hydrogen sulfide content – from 1.2 up to 4.3 % wt.

Ammonia content – from 0.4 up to 2.8 % wt.

Water content – 94.66 % wt.

Oil product content – up to 3 % wt. (Density is 895 kg/m^3 , Viscosity is 35.8 cP)

Process unit	Acid water production, m^3/hour
Hydrocracking	20
KR-600 (Catalytic Reforming with CCR unit)	0.2

Process unit	Acid water production, m ³ /hour
VT-6 (Visbreaking)	7
1A-1M (FCC unit)	13
Л-24/6 (Hydrotreatment unit)	2
ЛЧ-24/7 (Hydrotreatment unit)	2.2
УПС (Sulfur production unit)	1.5
Изомалк-2 (Isomerization unit)	0.1
ГОВКК (FCC gasoline hydrotreatment unit)	0.2
ГО ДТ (секция 100) (Diesel fuel hydrotreatment unit), section 100	3.95
Масла III-группы (III Group Base Oils Production unit)	1.2
Total:	51.35

5. **STANDARDS**

EU standards of construction and operation are to be considered whilst meeting mandatory local requirements.

6. **DESIGN ENVELOPP (UNIT OPERATING RANGE)**

The range of the unit stable operation is: 40-110% of feed capacity.

7. **EQUIPMENT**

LICENSOR shall specify:

- Critical equipment characteristics.
- Number of critical equipment items.
- Which portion of critical equipment can be delivered by Russian vendors.
- Are there any other alternative vendors (or the only vendor)?
- Critical equipment which is to be supplied by the LICENSOR.
- Terms of delivery.

8. **OTHER REQUIREMENTS**

LICENSOR shall propose visiting the operating units for the Client to get acknowledged.

LICENSOR shall specify the full and exact details about the above mentioned units, namely

- Location
- Capacity
- Date onstream

9. **CUSTOMER SPECIAL REQUIREMENTS**

9.1. Hydrogen sulfide containing gas from the unit shall be suitable for using as a feed for sulfur production processes (Claus) and sulfuric acid production by WSA method.

9.2. Ammonia containing gas shall be neutralized by means of N₂ oxidation.

9.3. Technical and Commercial Proposal shall contain within its scope the initial data for environmental evaluation of the planned activities in accordance with item 12 of Paragraph C hereof.

10. **BATTERY LIMITS CONDITIONS:**

10.1. **Feed**

Product	Pressure, kg/cm ² (g)		Temperature, °C	
	min	max	min	max
Sulfide containing effluents	1.1 (oper.)	11.0 (design)	40 (oper.)	120 (design)

10.2. Products (to be indicated by LICENSOR)

Product	Pressure, kg/cm ² (g)		Temperature, °C	
	min	max	min	max
Stripped water				
Hydrogen sulfide containing gas				
Ammonia containing gas				

10.3. UTILITIES

10.3.1. Steam

Stream	Pressure, kg/cm ² (g)			Temperature, °C		
	Min. (at the battery limit)	Operation (near the source)	Design (max. near the source)	Min. (at the battery limit)	Operation (near the source)	Design (max. near the source)
HP steam	Not available					
MP steam	10.0	12.0	15.0	189	250	280
LP steam	2.0	3.0	6.0	133	143	250

10.3.2. Steam condensate

Stream	Pressure, kg/cm ² (g)		Temperature, °C	
	min	max	min	max
LP steam condensate	2.0	6.0 (design)	133	164 (design)
MP steam condensate	12.0	15.0 (design)	185	200 (design)

10.3.3. Water

Stream	Pressure, kg/cm ² (g)		Temperature, °C	
	min	max	min	max
Cooling water, supply	2.5	7.5 (near the source)	25	
Cooling water,	0.5		42	50

return				(design)
Chemically treated water	hold	hold	hold	hold
Hot water	по расчёту	8,0	130	150
Special requirements	1. Quality of chemically treated water shall correspond to requirements for boiling feed water quality for boilers with pressure exceeding 40.0 kg/cm ² abs.) 2. Temperature chart from Power Station -3: 130/70 °C. Heating period is 220 days and nights.			

10.3.4. Air

Stream	Pressure, kg/cm ² (g)		Temperature, °C	
	min	max		min
Process air	4.0	6.0	Process air	4.0
Instrument air	3.5	4.5	Instrument air	3.5
Special requirements	1. Instrument air design temperature = - 46°C, dew point = - 40°C			

10.3.5. Nitrogen

Stream	Pressure, kg/cm ² (g)		Temperature, °C	
	min	max	min	max
LP Nitrogen	1.0	7.0 (near the source)	ambient	ambient
HP Nitrogen	6.0	64.0 (near the source)	ambient	ambient
Composition	N ₂ =99.6%, O ₂ =0.4%			
Special requirements	1. Design temperature = -46 °C. 2. Design pressure (near the source): for LP Nitrogen 8.2 kgf/cm ² (g), for HP Nitrogen 72.0 kgf/cm ² (g).			

10.3.6. Fuel

Stream	Pressure, kg/cm ² (g)				Temperature, °C			
	min	normal	max	design	min	normal	max	design
Fuel gas	1.5	2.0 – 5.0	5.0	10.5	-46	ambient	50	-46/100

Average composition in % wt.								
Nitrogen	6.78							
CO	0.06							
CO ₂	0.01							
Hydrogen	6.66							
Methane	10.97							
Ethane	10.65							
Ethylene	6.12							
Propylene	14.72							
Propane	23.23							
Σ butylene	1.44							
i-butane	6.76							
butane	8.85							
pentane	0.98							
i-pentane	2.76							
hydrogen sulfide content, mg/m ³	maximum 150							
Special requirements	1. Density: 0.56 – 1.08 kg/m ³ 2. The lowest heating value at 25 °C: 9263 - 12634 kcal /nm ³							
Natural gas (GOST 5542)	2.5	3.0	4.0	6.0	20	30	40	45
Heating value, MJ/m ³ (kcal/m ³), at 20 °C and 101.325 kPa, min.	31.8 (7600)							
Wobbe index range (highest), MJ/m ³ (kcal/m ³)	41.2-54.5 (9850-13000)							
Allowable deviation of Wobbe index from the nominal value, % max.	±5							
H ₂ S wt. concentration, g/m ³ , max.	0.02							
Mercaptan sulfur wt. concentration, g/m ³ , max.								
Oxygen vol. %, max.	0.036							
Weight of mechanical impurities in 1 m ³ , g, max.	1.0							
	0.001							

10.3.7. Electrical Power Supply

Description	Voltage	Frequency
	Volt	Hz
Electrical Power		
High voltage	6000	50
Low voltage	380/220	50
Special requirements	1. For Motor with capacity ≥200 kWt – 6000 V, 50 Hz 2. For motor with capacity <200 kWt– 380 V, 50 Hz	

SECTION C - PROPOSAL – CONTENT OF TECHNICAL SECTION

PROPOSAL shall be provided both in English and Russian (in case the LICENSOR is registered outside the Russian Federation). In case the LICENSOR is registered within the Russian Federation the technical proposal shall be provided in Russian. The Technical PROPOSAL from the LICENSOR shall include the following. (Please note that all calculations are to be presented in value per MT (metric ton) of final product).

1. THE DESCRIPTION OF TECHNOLOGICAL PROCESS

- Process configuration;
- Operation conditions;
- Initial data of the process;
- Process descriptions;
- Possible integration with the existing refinery scheme;

2. OVERALL MATERIAL BALANCE, PROCESS UNIT MATERIAL BALANCE & SPECIFICATIONS, EFFLUENTS

- Overall Material and Heat Balance with product properties;
- Amount and quality of liquid effluents and emissions into atmosphere;
- Block flow diagram and typical process flow diagram;
- Operation limits and flexibility;
- Feed and loading limitation;
- Turnaround cycle;

3. CATALYSTS AND CHEMICALS REQUIREMENTS, AMOUNTS & CONSUMPTION FIGURES

- All the catalysts and chemicals requirements including the requirements to catalyst preparation before the loading;
- Catalyst operation manual;
- Required amount of catalyst and chemicals, their consumption;
- Potential catalyst vendors;

4. UTILITIES AND CHEMICALS CONSUMPTION

- Utilities and chemicals consumption;
- Electrical power requirements, electrical power consumption, etc.

5. EQUIPMENT LIST

- Sized equipment list for the targeted capacity;
- Long lead and critical equipment to be determined separately (with indication of size, weight, split for transportation feasibility, assembling and shipment time);
- List of recommended /approved suppliers (vendors).

6. LIST OF EFFLUENTS REQUIRED FOR TREATMENT

7. ESTIMATED SCHEDULE FOR EACH STAGE OF PROJECT.

8. INVESTMENT COST ESTIMATE, including:

- All license fees (know-how);
- Engineering, procurement and technical supervision fees;
- Catalysts and other special additives;

- Cost of all the equipment with a separate indication of the cost of any specialized equipment which will be supplied by Licensor;
- Cost of technical Services (start up services and technical support);
- Schedule for preparation of Basic Engineering Design package;
- Capital investments with separate indication of the costs of Equipment, construction and erection works, design and research works, etc.

9. EXPERIENCE

- List of former experience and technology references;
- Number of licenses sold in the past ten years;
- The list of designed and operating units, start-up date and capacity of all the units;
- Operating Data from similar units;
- Liquidated damages max amount;
- Catalyst/Process upgrading program;
- List of approved Contractors.

10. INFORMATION RELATED TO THE NECESSITY OF CONCLUDING THE FOLLOWING:

- License Transfer Agreement;
- Basic Design Engineering Agreement;
- Guarantee Agreement;
- Catalyst Supply Agreement;
- Equipment Supply Agreement;
- Confidentiality Agreement;

11. GUARANTEES

- Limits on Guarantees for Engineering and Process Performance;
- Catalyst consumption;
- Capacity of the unit;
- Yield products quality indicators;
- Others;

12. DECISIONS ON LABOR SAFETY AND ENVIRONMENTAL PROTECTION

- Liquid effluents (the amount based on the unit operation during 8, 760 hours per year);
- Solid discharges (the amount based on the unit operation during 8, 760 hours per year);
- Emission into atmosphere (the amount based on the unit operation during 8, 760 hours per year);
- Wastes (the amount based on the unit operation during 8, 760 hours per year);
- Solutions on labor safety and environmental protection issues;
- Compliance with perspective standards and regulations;
- Disposal methods of generated effluents;

13. TECHNICAL SUPPORT AND ADDITIONAL SERVICES

- Scope of work on technical support;
- Scope of service on personnel training, commissioning and start up;

Chief Engineer	E.N. Karasev
Chief Process Engineer	E.V. Dutlov
Deputy Chief Engineer for Technological Processes	A.V. Piskunov
Chief Engineer of Capital Construction Department	K.A. Mikhailov
Head of Commissioning and Start-Up Department	S.A. Saltykov
Head of Workshop №9	V.E. Znaemov
Head of Workshop №5	N.N. Lukashov