

# **EPC-Company**

# EPC-Engineering, Procurement, Construction Company OIL and GAS INDUSTRY

PETROLEUM REFINING

GAS REFINING

PETROLEUM CHEMISTRY

GAS CHEMISTRY











#### **BRANCHES OF ACTIVITIES**

- Design engineering of petroleum refining and petroleum chemistry facilities;
- **Development of detailed engineering drawings for the equipment;**
- Application of mathematical simulation method at machinery construction and processes modeling;
- > Manufacture and supervised installation of oil and gas process equipment;
- Organization of overdimensioned equipment delivery through application of the combined transportation schemes;
- Installation of the equipment including overdimensioned one, carrying out of construction works on site;
- > Furnishing with the main constructional materials at equipment manufacture;
- Usage of forefront of modern researches in the sphere of petroleum refining and petroleum chemistry;
- Implementation of new development (know-how) in the sphere of design engineering and manufacture of oil and gas equipment.



#### **GENERAL INFORMATION ON THE COMPANY**

### Year of foundation

#### Number of employees



220 persons

1996

consisting of following structural units:

Design Department; Engineering Department; Mathematical simulation Department;

**Project monitoring Department:** Oil and gas equipment division;

Manufacturing division; Complete set division (include materials);

Logistics Department; Construction and Erection Department; Foreign Economic Activity Department; Financial Department.



**ANNUAL SALES / MARGIN** 





#### **OUR CUSTOMERS**









#### PARTNERS: MACHINE-BUILDING PLANTS



## Volgogradneftemash OAO



#### OMZ OAO



Korostenkhimmash OAO



Salavatneftemash OAO



EA

UTS-Tujmazykhimmash OAO

#### ZIO-Podolsk OAO



#### Tatneft-Bugulma Machine-Building Plant OAO



#### Kurgankhimmash OAO



Kotloturboprom OOO (Kharkov Boiler-Mechanical Plant OAO)



#### **Borkhimmash OAO**



Chernovtsy machine building plant OOO



Khimmash RAN plant FGUP



#### PARTNERS: MACHINE-BUILDING PLANTS





#### **PARTNERS: METALLURGICAL PLANTS**



#### **Pervouralsky Novotrubny** Zavod OAO

**Sinarsky Tube Mill OAO** 

**Nikopol Pivdennotrubny** Works OAO



**Volzhskiy Tube Mill OAO** 



#### **Severstal OAO**

**Consolidated Machinebuilding Plants – Spetsstal OAO** 



#### **Magnitogorsk Metallurgical** Works OAO



**Metallurgical Works Azovstal** OAO



**Kramatorsk Metallurgical** чгмк Plant OAO



**Belgorodenergomash OAO** 

Our own metal products warehouse facilities were establisjed in the territory of Moscow oblast and Sverdlovsk oblast, as well as in the territory of the Republic of Bashkortostan and the Republic of Tatarstan. The aim is to achieve maximum material supply effectiveness and to minimize the delivery period.



#### **DEPARTMENT COMPOSITION:**

- Preliminary Design Department;
- Chief Project Engineers Bureau;
- Manufacturing engineering Department;
- Erection Department;
- Construction Department;
- Electrical Engineering Department;
- Instrumentation Department;
- Automated Process Control Systems Department;
- Design-engineering Department;
- General Planning;
- Water Supply and Sewage;
- Heating, Ventilation;
- Cost Estimate Department; Process and Experimental Department.







#### **PRIMARY OBJECTIVES:**

- Design engineering of petroleum refining and petroleum chemistry facilities. Execution of the baseline and detail projects;
- Design process optimization and design period reduction;
- Construction time reduction by means of working in parallel with the other Company's divisions;
- Introduction of innovative technologies;
- High performance quality assurance.

## **OUR ADVANTAGES:**

- Our own Automated Process Control Systems Department being capable of development of the process software hand in hand with the main design engineering process;
- Application of the leading techniques and stateof-the-art software products, particularly PDMS-AVEVA-based 3D-simulation;
- Consideration of equipment manufacture and logistics problems (especially of bulk one);
- Definition of the construction-and-erection and commissioning works issues at the design stage;
- > Flexibility at the technical decisions making.



#### **DEVELOPMENT OF THE BASELINE PLANT PROJECTS:**

- Sulfuric acid alkylation in jet reactor;
- ➤ MTBE; ETBE; TAME

#### PLANT DETAILED ENGINEERING under licenses:

## HALDOR TOPSOE

CATALYSING YOUR BUSINESS

Haldor Topsoe;

## ExonMobil

Exxon Mobil Corporation;



Chevron Lummus Global (CLG);





Axens;



DuPont;



WorleyParsons

Worley Parsons; etc.





#### PARTNERS: DESIGN and SCIENTIFIC ORGANIZATIONS

PIRO ZAO PMP ZAO CKBN DOAO VNIINP OAO IKT-Service OOO VNIPINeft OAO Neftekhimproject ZAO Lengiproneftekhim OAO Bashgiproneftekhim GUP Omskneftekhimproject OAO Samaraneftekhimproject OAO Angarskneftekhimproject OAO NizhgorodNIInefteproject OAO VNIIPThimnefteapparatura OAO









#### **GK RAN – VNIINEFTEMASH OAO**



**VNIINEFTEMASH OAO** is the Russian Federation chief institute on development of modern standards and rules at design and manufacture of pressure vessels and on development and creation of new types of petroleum refining equipment.

# VNIINEFTEMASH OAO is the strategic partner of the GK RAN over a period of 14 years.

The development of detailed engineering drawings, consideration of configuration data sheets, order forms, as well as the technical support of the equipment manufacture is carried out by the experts of our Company under the designer's technical supervision of the VNIIneftemash OAO.





#### **PRIMARY OBJECTIVES:**

- Development of drawings and preliminary sketches.
- Issuance of work design documents
- Manufacture field engineering support.
- > Pre-tender project preparation

#### **ADVANTAGES:**

- > Shortest possible execution period
- > Wealth of experience
- > Highly qualified personnel
- > Design codes compliance control
- Application of unique software tools (including proprietary developments)





# Design of pipe-still heaters of various constructions

- With overhead flue gas extraction and horizontal / vertical radiant tubes;
  - With overhead convection chamber;
- > With annular convection chamber;
- Sectional;
- Modular oil-field pipe-stills.





Design of column equipment, reactor equipment, tanks and vessels

- Drainage tanks;
- Oil-products storage tank;
- Holding tanks;
- Apparatuses with the stirring devices;
- Rubber-lined vessels;
- > And others.



#### Heat-exchange equipment design



- Floating-head heat exchangers;
- Fixed head heat exchangers;
- Heat exchangers with U-tube bundle;
- Kettle-type evaporators;
- Pipe-in-pipe heat exchangers;
- > Thermosyphon evaporators;
- > And others.



#### PROJECTS SUPPORT EQUIPMENT SUPPLIES, SERVICE

#### **PRIMARY OBJECTIVES:**

## PROJECT ORGANIZATION FROM THE BASIC ENGINEERING TO COMMISSIONING AND START-UP:

- Basic Engineering Design;
- Front End Engineering Design;
- Detail Engineering;
- Constructional design of oil and gas equipment of any complexity;
- Process equipment manufacture and supply;
- Materials procurement;
- Organization of interplant cooperation;
- Designer's and technical supervision of manufacture;
- Logistics;
- Construction and erection;
- Commissioning and Start-up;

that shall allow considerably reduction of the project implementation term and executed works quality assurance on the basis of simultaneous solving of problems of process equipment design, manufacturing and supply, necessary materials procurement, equipment construction and erection, and providing of close cooperation between all contracting agencies (including foreign ones).



#### PROJECTS SUPPORT EQUIPMENT SUPPLIES, SERVICE

**DESIGNER'S AND TECHNICAL SUPERVISION OF MANUFACTURE** 



#### **CONTROL AT EVERY MANUFACTURE STAGE**



#### **REPRESENTATIVE OFFICES AT THE MACHINE-BUILDING PLANTS**



**REACTOR EQUIPMENT** and removable internals

- Heavy Wall Reactors; Hydrocrackers; Hydrotreaters (HDT);
- Heavy still bottoms catalytic crackers (including for the RCC facility);
- Catalytic crackers (including for the FCC facility);
- Catalytic reformers (including for the CCR facility);
- > Hydrogen generation units;
- GC RAN jet reactors for the isobutanes/ olefins sulfuric acid alkylation units.







#### SEPARATORS

and removable internals including as follows

> High pressure separators for hydrocracking unit:

Hot separators; Cold separators; Centrifugal separators.

#### Hydrotreating unit separators:

Hot separators; Cold separators.

> Vertical and horizontal separators.





#### **HEAT-EXCHANGE EQUIPMENT**

- > High pressure heat exchangers (up to 200 atm.) with breech-lock for hydrocracking units;
- Tight feed heat exchangers for hydrotreating units;
- Heat exchangers with built-in flow energizer;
- Reboilers;
- Plate heat exchangers;
- Custom-tailored shell-and-tube heat exchange equipment.





#### COLUMN EQUIPMENT and removable internals

- Fractionators;
- Strippers;
- Stabilizers;
- Vacuum distillation units;
- Absorbers;
- Deethanizers;
- Scrubbers, etc.

#### For following units:

- > CDU, VDU;
- Hydrocracking;
- Hydrotreatment;
- Catalytic cracking;
- Catalytic reforming;
- Isomerization;
- > Alkylation;
- ▶ MTBE, etc.





- Furnace equipment;
- Air-cooler units (ACU) including high pressure ACU for the hydrocracking plants;
- Tanks and vessels;
- Equipment modules as assembly units: (separator, divider, degasifier, tank and fitting units);
- Compressor and pumping equipment;
- CDU equipment











#### **PRIMARY OBJECTIVES:**

- Transportation flow chart substantiation;
- Selection of the special transport carriers;
- Determination of loading-unloading operations methods and means;
- Cargo securing chart drafting;
- Design work on transportation;
- Obtaining of the required approvals and permits of road services;
- Designer's supervision during preparatory and main cargo transportation operations;

#### > Transportation:

- > road transport;
- railway transport;
- > river and marine transport.







#### **OUR ADVANTAGES:**

We are ready to work out and propose the route of any complicity for transportation of bulk and out-ofgauge equipment irrespective of the end place of destination, involving at each stage all the necessary types of transport: road, river, marine, railway and air;

We coordinate and carry out transportation of complex out-ofgauge equipment, as well as of any other equipment for petroleum refining and petroleum chemistry industry; We carry out all the design and road construction works;

- We carry out loading and unloading operations with the use of crane facilities, hydraulic systems of specialized equipment, as well as the horizontal and vertical lifting devices for load handling by means of hoisting jacks, pushers and special-purpose equipment;
- We guarantee reliable and on-time equipment delivery to our Customer.











### **PARTNERS**:

- Russian Railways OAO;
- **RosDorNII**;
- PodvodRechStroj OAO;
- Industry port ZAO;
- InSpecCom OOO;
- SpecTjazhTrans OOO;
- SOP&G 000;
- ROSNO ZAO and others

















#### CONSTRUCTION AND ERECTION DEPARTMENT



## **PRIMARY OBJECTIVES:**

- Analysis, forecasting and assessing of general constructional and erection works;
- Value analysis of general constructional and mechanical erection works;
- Transportation and special equipment works;
- Substantiation of lifting equipment selection;
- Design and preparation works development;
- Cost estimates;
- Development of the progress schedule charts, daily and monthly progress schedule charts, activity types detailing;
- > Welding operations;
- > Equipment erection;
- > Pipelining;
- > Overpass erection;
- Quality control and testing.





#### CONSTRUCTION AND ERECTION DEPARTMENT

#### **ADVANTAGES**:

- Constant market monitoring, knowledge of existing prices;
- Construction on a turnkey basis;
- Costs reduction
- Independence of subcontractors;
- Participation at the stage of the project documentation development;
- Availability of own and leased lifting equipment;
- Declared price assurance;
- The Customer's risks reduction due to responsibility and administration centralization in single contracting agency;
- Highly qualified personnel;
- > Presence of partner contracting agencies in the regions.





#### **Primary objectives:**

- Mathematical simulation with the use of advanced numerical approaches (finite-element packages Ansys, Star-CCM+) of chemical technology processes in hydrodynamics and of heat exchange processes for ensuring of maximum performance efficiency of the process equipment manufactured by the GC RAN;
- > Numerical simulation of strength properties of the designed equipment;
- Mathematical simulation of conjugate problems of heat exchange, strength and hydrodynamics;
- Development of process solutions at design engineering of new equipment;
- Estimate of performance efficiency of the existing process equipment and provision of recommendations as to of its operation optimization.

### Advantages:

#### Introduction of mathematical simulation approach:

- Reduces manyfold the selection time of optimal apparatus construction;
- Allows visualization of simulated mass and heat transfer processes;
- Partially functions as laboratory or production testing.



#### Hydrodynamic calculations at process equipment design







#### **Development of process equipment internals (hydrocracker unit)**





#### Heat exchange intensification in shell-and-tube heat exchangers

#### Shell side





#### Tube side



#### Plain tube



#### Finned tube



#### **Spiral band**

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#### Spiral wire structure



#### Static strength calculation at equipment design



#### Shell-and-tube heat exchanger



High pressure valve gate (200 atm)



#### **Double tubesheet**



# Mathematical simulation of the conjugate heat exchange, strength and hydrodynamics problems



Interstage heater





#### Hot reactor head





#### Introduction of new developments in design engineering and technology:

- Tight feed heat exchangers for hydrotreatment facilities. Tight feed heat exchangers operating at the pressure differential between tube and shell sides >10MPa;
- Jet apparatuses, such as reactors, are intended for production of efficient liquid-liquid type emulsions for isobutanes/olefins sulfuric acid alkylation units;

Introduction of mathematical simulation approach at apparatus design engineering;

Hydraulic cyclones intended for immediate breaking of emulsified two-phase systems.





Tightfeedheat-exchangersforhydrotreatmentandcatalyticreforming units

#### The list of the proposed works:

- engineering design development;
- kitting-up;
- manufacture;
- > delivery to the Customer's warehouse.





#### **TIGHT FEED HEAT-EXCHANGERS**

**Objectives of the equipment development:** 

- prevention of gas crude mixture and gas products mixture intermixing (ensuring of structural continuity);
- > increase in unit thermal efficiency.

#### **Structural solutions:**

- application of double tubesheet of original construction approved by the VNIIPTkhimnefteapparatury OAO;
- application of seamless U-tubes without butt welds;
- Exclusion of flange connectors inside the vessel due to the use of U-type tube bundle; increase in reliability of tube to tubesheet connection due to the tube vibrations reduction in the tubesheet adjacent areas and between the baffles as a result of:
  - > diameter clearance reduction between the tubesheet holes and tubes,
  - > diameter clearance reduction between the baffles and heat exchanging tubes,
  - installation of anti-vibration baffles;
- application of U-type tube bundle with the longitudinal baffle in the shell resulting in ensuring of counter-current flows, which is the important factor for increase in thermal efficiency at equal gas crude mixture and gas products mixture flow rates.



# New sulfuric acid alkylation process on the basis of jet reactor

Reactor P-2ĸ, plant 25/7, Slavneft-YANOS OAO, Yaroslavl in operation since 2000

List of the proposed works: Plant turnkey construction – from basic engineering up to commissioning





#### SULFURIC ACID ALKYLATION PROCESS ON THE BASIS **OF JET REACTOR TECHNOLOGY**

#### **MAIN CHARACTERISTICS OF JET REACTOR**

>	Weight	- 10 tons
>	Volume	- 10 m <sup>3</sup>
>	Operating pressure	- 6 atmg
>	Products stay time	- 60 sec
>	Olefins weight hour space velocity	- 3 h <sup>-1</sup>
>	Operating temperature	- 12 <sup>0</sup> C
>	Olefins to isobutane internal ratio	- 1:35
>	Rated capacity	- 200 t/day





#### SULFURIC ACID ALKYLATION PROCESS ON THE BASIS OF JET REACTOR TECHNOLOGY

SCHEMATIC DIAGRAM OF JR UNIT







#### SULFURIC ACID ALKYLATION PROCESS ON THE BASIS OF JET REACTOR TECHNOLOGY Comparison of technical and economical indices

	Exxon	DuPont	R	Ran Group	
Operating temperature, ° C max.	9	9		15	
Alkylate output, t/day	850	850		850	
Octane number	96.3 RON	96.3 RON	9	96.3 RON	
Number of reactors	1	4		4	
Number of settlers	1	4		5	
Reactors supply					
Compressor, kW	2030	2580		2200	
Mixers, kW	400	1490		-	
Pumps, kW	600	600		1300	
Total, kW	3030	4670		3500	
BCooling water, m <sup>3</sup> /hour	2700	2800		2700	
Steam, t/hour	45	45		45	
Fresh acid, tons per day	69-75	70-75		70	
Fresh acid, kg/ton of alkylate	82-88	85-90		85	





#### SULFURIC ACID ALKYLATION PROCESS ON THE BASIS OF JET REACTOR TECHNOLOGY

- Conceptually new type of reactor unit is developed and manufactured for the sulfuric acid alkylation process;
- The reactor unit is successfully operated for more than 10 years.

#### **ADVANTAGES:**

- Improvement of operational performance and increase in reliability due to absence of built-in agitators;
- Reduction in capital costs due to the reactor compact size;
- Improvement of the industrial safety performance due to the considerable reactor downsizing;
- Considerable reduction in the feed stay in reaction zone, improvement of the process control and reduction in the system response time;
- Simplification of maintenance and repair, reduction in operational expenses;
- > The jet reactor allows processing of propylene feed.





#### Our organization holds proprietary patent "Alkylbenzene production process"







#### EURASIAN PATENT №013873 «Method of alkylate production and reactor of sulfuric acid alkylation of i-butane with alkenes»

ЕВРАЗИЙСКАЯ ПАТЕНТНАЯ ОРГАНИЗАЦИЯ ЕВРАЗИЙСКОЕ ПАТЕНТНОЕ ВЕДОМСТВО

#### ЕВРАЗИЙСКИЙ ПАТЕНТ

№ 013873

Название изобретения: «СПОСОБ ПОЛУЧЕНИЯ АЛКИЛБЕНЗИНА И РЕАКТОР СЕРНО-КИСЛОТНОГО АЛКИЛИРОВАНИЯ ИЗОБУТАНА ОЛЕФИНАМИ»

#### Патентовладелец (льцы)

ГЕРШУНИ СЕМЕН ШИКОВИЧ; ЕМЕЛЬКИНА ВАЛЕНТИПА АПДРЕЕВНА; ЖИХАРЕВ РОМАН ВЛАДИМИРОВИЧ (RU)

#### Изобретатель (и):

Гершунн Семен Шикович (RU)

ARRA NO:

201000140

Дата подачи заявки: Пата выдачи заявки:

18 августа 2008 г.

30 августа 2010 г

Настоящим удостоверяются, что евразийский патент выдан на изобретение, изложенное в прилагаемом описании и формуле изобретения.

При уплате установланных годовых пошлин патог действует на территории тосударств участиемо Евразийской потентиби комвенция – Алербайджанской Растублики, Кыргызской Республики, Республики Аленски Ростублики Баларусь, Республики, Республики Аленска Молдова, Республики Тадикинстан, Российской Федерации

ГРИГОРЬЕВ Александр Николаевич Президент Евразийского патентного ведоиства



#### LICENCE AGREEMENT FOR MTBE

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	приложение
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Ji	ицензиат: Общество с ограниченной ственностью «РБС-Холдинг» (RU). Запись внесена в Государственный реестр изобретений Российской Федерации 13 декабря 2011 г.

Форма № 50 Д-2009 ФЕДЕРАЛЬНАЯ СЛУЖБА ПО ИНТЕЛЛЕКТУАЛЬНОЙ СОБСТВЕННОСТИ (РОСПАТЕНТ) Беревковская наб., 30, корп. 1, Мосика, Г-59, ГС15-, 123995. Телефон (8-499) 240-60-15. Факс (8-495) 234-30-58

Наш № 2011Д18351/93

#### УВЕДОМЛЕНИЕ о государственной регистрации договора

Рассмотрено поданное 11.11.2011 заявление о государственной регистрации лицензионного договора о предоставлении права использования изобретения.

Уведомляю о государственной регистрации лицензионного договора о предоставлении права использования изобретения.

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(11) Патент на изобретение №2248343

Имя и адрес лица, предоставляющего право использования -Открытое акционерное общество Научно-исследовательский институт "Ярсинтез" 15040, г. Ярославль, пр. Октября, 88

Имя и адрес лица, которому предоставлено право использования -Общество с ограниченной ответственностью "РБС-Холдинг" 105066, Москва, ул. Нижняя Красносельская, 39, стр. 2

Руководитель

Б.П. Симонов









#### MAIN COMPETITIVE ADVANTAGES OF GK RAN:

Development of the design engineering documents for the equipment including based on configuration data sheets of the foreign companies (bringing to conformity with the requirements of standards and regulations of the Russian Federation);

Possibility of the real-time alteration of the engineering designs and those approval at the stage of the detailed engineering documentation development;

3.

Continuous monitoring and appraisal of qualification, specialization, capabilities and level of workload of the Russian machinebuilding plants – the manufacturer selection optimization; Long-term experience in organization of design, manufacture and supply of the equipment of any complexity;

Long-term partnership relations with the main design organizations, machinebuilding and metallurgical plants of the Russian Federation and CIS, as well as with the construction and erection organizations;



Availability of logistics and bulky cargo forwarding department;





#### MAIN COMPETITIVE ADVANTAGES OF GK RAN:

Reduction in equipment design and manufacture period at the machine-building plants and facilities commissioning period up to 25-30% due to as follows:

- close cooperation of all the company's departments, carrying out of the operations in parallel;
- Iong-term partnership relations;
- presence of the Company representatives directly at the machine-building plants;
- availability of own storehouses and rolled metal products supply service;

- supply of the key materials for our orders. The materials and accessories are procured at the stage of draft design;
- efficient cooperation with structural designers of the machine-building plants;
- equipment manufacture supervision at all the stages from design to shipment;





New

developments

implementa-

tion

#### MAIN COMPETITIVE ADVANTAGES OF GK RAN:

8.

Availability of the qualified experts capable to solve complex problems: technologists, designers, structural designers, mathematicians, mechanicians, inclusive of specialists having academic degrees and long-term experience in industries;

Continuous monitoring and introduction of state-of-the-art achievements in petroleum refining and petroleum chemistry;

Introduction of advanced petroleum refining and petroleum chemistry equipment developments in cooperation with the VNIINeftemash OAO;

Construction

and erection

Design

engineering

• Organization of own design activity in the petroleum refining and petroleum chemistry;



Application of the processes mathematical simulation approach at apparatuses design engineering;



Logistics

Financing

Equipment

supply,

service

Implementation of the EPC Company concept.

Process

simulation

Development



#### SERTIFICATES AND PERMITS

#### Our organization has all the required permits





#### SERTIFICATES AND PERMITS

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#### SERTIFICATES AND PERMITS







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