

EQUIPMENT FOR PETROCHEMICAL PLANTS AND OIL REFINERIES



REEFING

REEFING Co., Ltd.

ABOUT COMPANY	2
INTERNALS FOR CATALYTIC REFORMING AND HYDROFINING RADIAL FLOW REACTORS	5
INTERNALS FOR REACTORS WITH RADIAL FLOW GOING THROUGH THE CENTERPIPE	6
SCREEN DESIGN	7
INTERNALS FOR REACTORS OF HYDROFINING, HYDROCRACKING WITH AXIAL FLOW	8
INTERNALS FOR REACTORS OF HYDROFINING OF VIRGIN DIESEL FUEL	9
INTERNALS FOR REACTORS OF ISODEWAXING OF MINERAL OILS	10
INTERNALS FOR REACTORS OF ISOMERIZATING FACILITIES	11
INTERNALS FOR REACTORS OF THE VACUUM GASOIL HYDROFINING	12
INTERNALS FOR REACTORS OF HYDROFINING OF GASOLINE FRACTION OF THE GAS CONDENSATE	13
INTERNALS FOR REACTORS FOR CATALYTIC DEHYDROGENATION OF ETHYL BENZENE INTO STYRENE	14
FILTERS AND FILTERING FLOORS	15
FILTERS FOR HEAT EXCHANGERS	16
FILTERS FOR LIQUIDS AND GASES	17
LAMELLATED HEAT EXCHANGERS	18
COLUMN ORIFICES	19
COLUMN ENTHALPY EXCHANGER INTERNALS	20



Dear friends,
 I salute you on behalf of the REEFING company.
 Our company is constantly moving towards its Customers, better understanding of the facing needs and problems, more convenient dialog irrespectively any prevailing conditions, and mutually beneficial success. In some cases we are too pertinacious, even «annoying» in our aspiration to seize the Customer's wishes to a nicety. However, our feeling lies in the necessity to clarify all the details in both technical and maintenance (convenience and simplicity of the assembly-disassembly procedure in the

shortest time period) spheres long before a contract is signed. We managed to gain a footing in the market of makers of the petroleum-refining means owing to:

- creation and use of a row of the unique production technologies;
- established and verified cooperation even with French partners - Johnson Screens;

and, what is the most important, due to harmonious and occupational work of the whole team.
 All the features make the services rendered by our Company the most profitable, and the only possible for some unique products. We are proud to

state that at present a lot of the the largest petroleum-refining companies apply solely to the REEFING company.
 The REEFING company implies:

- new developments;
- tried-out, reliable, proven products with the longest life times;
- high production quality;
- strict meeting of the contractual commitments!

Sincerely yours,
 M. Gusev

REEFING science and production limited company. Pattern of ownership: private company established in January 1994, Miass.

Business priorities: development of equipment (new technique products) for:

- petroleum-refining facilities: primarily internals for reforming and hydrofining reactors, internals for column enthalpy exchangers, internals for hydrocracking reactors, heat exchangers, filters for different mediums;
- agriculture: mainly sets of equipment for milking, milk cooling, and milk storage in various configurations;
- equipment for chemical preparation of water, well filters, filters for water purification from contamination.

Activities performed: exploratory designing, calculations, experimental designing, including strength and stand (hydrodynamic) testing, development of project drawings that are obligatorily agreed with Customer, work-out of documentation for production and maintenance, the products manufacture, supervision by developers and engineers during manufacturing and testing, presentation of the products to a Customer's representative at REEFING's own premises, participation in assembling at a Customer's site, designer supervision during equipment operation.

The company key staff is specialists who have accumulated extensive experience in creation of new space rocketry samples. At present our company staff numbers more than 100 people. 50 among them are engineers and managers, the rest are production personnel.

Our specialists come from the State Rocket Center (former Ministry of General Engineering Design Bureau of Machine Building), and are skilled in design of complicated technical hardware. The definitions of reliability and safety are well understood and have inculcated since development of the rocket complexes. Thus, we did not have to reform our specialists way of thinking: our job is grounded on responsible care.

The production staff have broad experience of work for acceptance according to military standards and skills of manufacturing equipment for oil-refining enterprises. All our specialists are properly licensed and have relevant permissions for the activities. Some of our welders have got the TUV certificates in Germany.

Among our engineering partners are: VNIINEftemash, Lengiproneftechim, PMP, VNIPIneft, Neftechimproyekt, KATACHIM, Neftechim, Bashgiproneftechim. Our strategic partner on column internals design and supply is **GTC Technology** (USA). Our strategic partner on slotted screen blank parts is **Johnson Screens** (France, USA).

The components are made with use of advanced technologies at plants located in Miass (MMZ), Zlatoust (PO ZMZ), Tryokhgornyy. The equipment final assembling takes place at REEFING's own premises. The assembling facilities are equipped with complete set of hardware and manned up with specialists to provide high quality of manufacture.

Quality Management System in REEFING is certified for the compliance with GOST R ISO 2001-2008 standard requirements.

All the activities on oil-refining items design and manufacture performed by REEFING are confirmed by corresponding licenses, certificates and permits.

In January 2012 REEFING has been granted Certificate of Registration in Shell Supplier Qualification System.



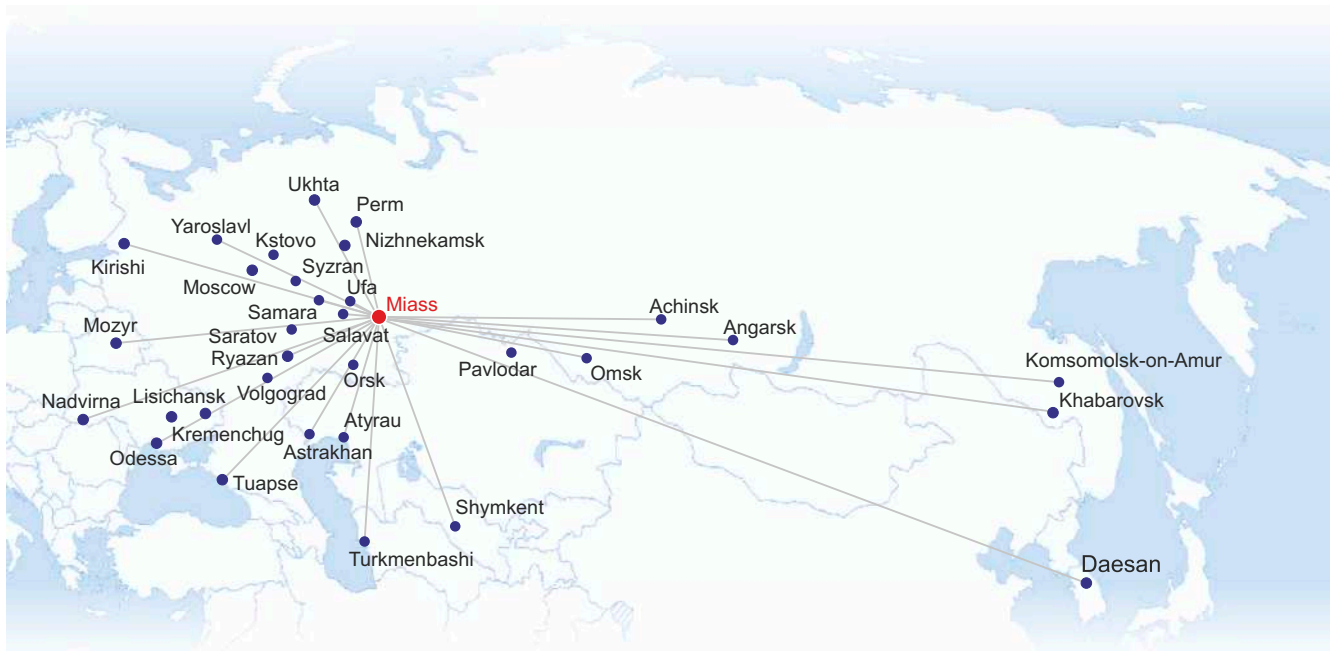
Unlike other suppliers of the analog hardware, we do not make any conventional or standard equipment. We are pursuing an objective of development of the up-to-date samples that should comply with modern requirements of the oil-refining production procedure and also the Customer's. That is the reason for performance of the whole cycle of activities: analysis of the Customer's initial data, engineering, including estimation of parameters, negotiations on and agreement of a project with the Customer, elaboration of documentation

and production of the items. A produced item is assembled/ disassembled in presence of the Customer at our premises. As a result we not only confirm quality of our products but rather train the Customer's personnel for assembly/disassembly operations of our products. Our experts mandatory perform the author's supervision of the internals installation inside a reactor.

A package approach used in design phase, engineering management in production combined with the

advanced technologies make items of the REEFING company of the high quality and allow us to work without any notices of defects within the whole life time.

We have developed our own methodology to analyze parameters of the reactor internals, reforming and hydrofining reactors.



A complex of computations, experimental activities and operation in field conditions confirm high quality of distribution of the raw gas mixture by our new structures.

Implementation of new technical and technological decisions permits products made by the REEFING company to dominate in the market. Our designs for the oil-refining facilities are patented with patents: 2127147, 2124937, 2137998, 2211423, 2217229, 2252384, 2281804, 2345832.

Our products for the oil-refining facilities operate at plants all over Russia

and CIS:

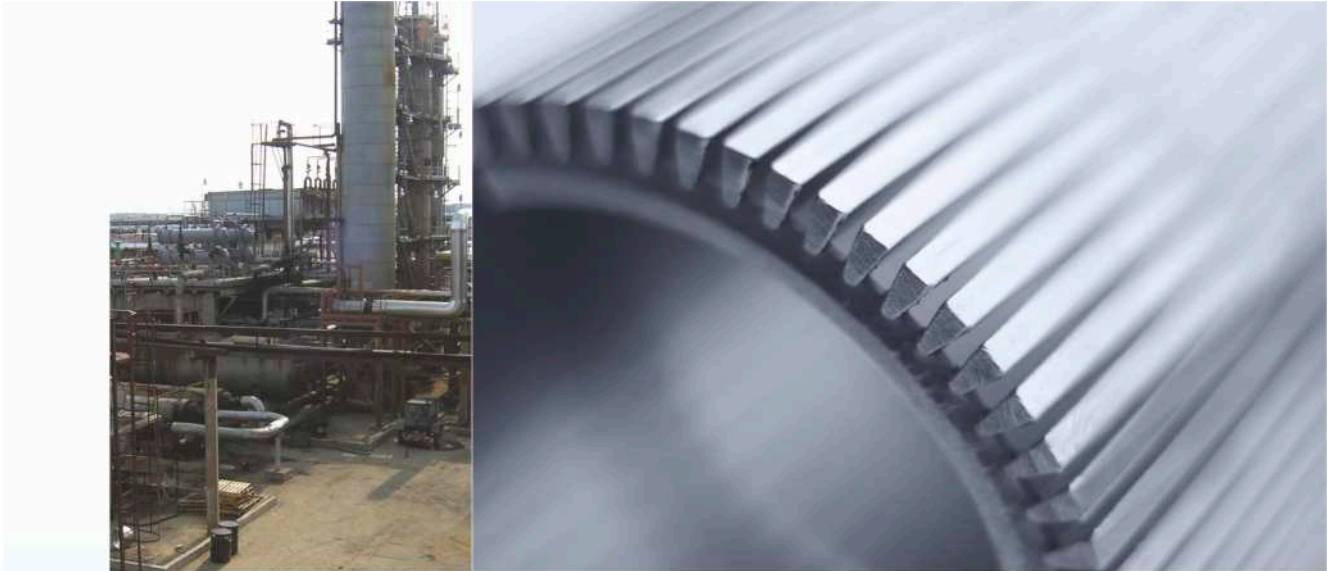
from Mozyr and Nadvirn in the West – to Khabarovsk in the Far East and from Ukhta in the North – to Chimkent in the South.

Since 1994 our company has produced more than 100 sets of equipment for hydrofining reactors of diesel fuel, vacuum gas oil, gasoline and kerosene fractions, not along more than 150 sets of internals for the reforming reactors.

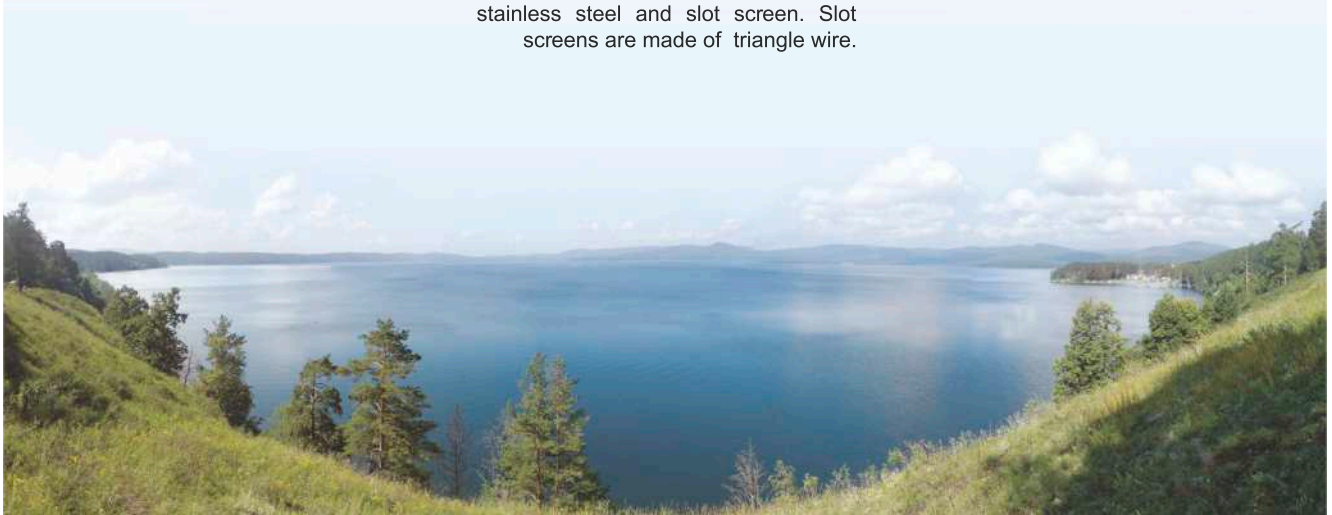
The key objective we aim at in development of internals for hydrofining and reforming, is to ensure more

effective operation of the oil-refining facilities. Our constant orientation to the tasks below assists in it:

- even distribution of the raw gas mixture across the section and the catalyst volume;
- minimum pressure drop (due to optimum ratios of the through sections in structural elements);
- enlarged time period between repairs (owing to increased lifetime of our products);
- reduced installation period (as a result of implemented new technical decisions, elaboration of installation guides, training of installers).



Design and manufacture of equipment for oil refining plants, hydrodynamic and strength calculations, calculations of parameters of internals for refining and hydrotreating reactors. The internals and various filters are made of stainless steel and slot screen. Slot screens are made of triangle wire.



All internals are made of stainless steel 12Cr18N10T, 08Cr18N10T (AISI 321).

As a rule the equipment is delivered in kits, specifications of the kit can be provided at the Customer's request.

The kit comprises:

- an upper distributor (1 piece)
- an upper cover (1 piece)
- a centerpipe (1 piece)
- a scallop (26...60 pieces)
- an expanding ring (2...4 pieces)
- a protective screen (if any) (1 piece)

Besides the mentioned above, the kit is completed with fixture to assemble and fix the upper cover, the upper distributor and the protective screen, if installed inside the reactor.



Centerpipe



Upper distributors



Upper cover with protective screen



Scallops

The upper distributor is designed to smooth the flow and filter the raw gas mixture in some cases. The item structure allows any adjustment in height.

The upper cover is intended to divide the reactor internals volume into two zones: a zone for generation of the flow and a reaction zone. The cover elements are connected with quick-detachable reusable fixture.

The centerpipe is designed to collect the reaction products and held the catalyst in the reaction zone. It is made of a perforated pipe with a welded slot screen (filter).

The scallops are intended to ensure even input and distribution of the raw gas mixture through the reactor reaction zone.

Made in two configurations with different structure for the flow running part - perforated and with slot screens. Perforated. The wall thickness is 1.2 mm, it is perforated with horizontal slots (15 slots or other number per a row).

With slot screens. The flow running part is made of gaps between the ∇ -shaped profiles of the slot screen.

The REEFING provided scallops are featured by:

- presence of a special device in the upper part to guarantee sealing between a scallop and the upper screen;
- easy assembly/ disassembly of the upper cover and scallops inside the reactor;
- possibility to disassemble keeping the product integrity;
- brackets to place expanding rings.

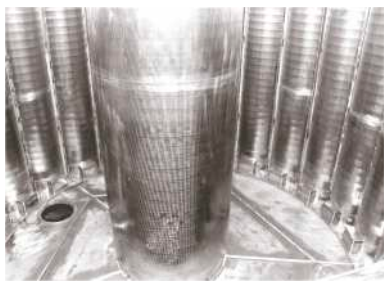
The expanding rings are designed to loosen scallops in a reactor.

INTERNALS FOR REACTORS WITH RADIAL FLOW GOING THROUGH THE CENTERPIPE

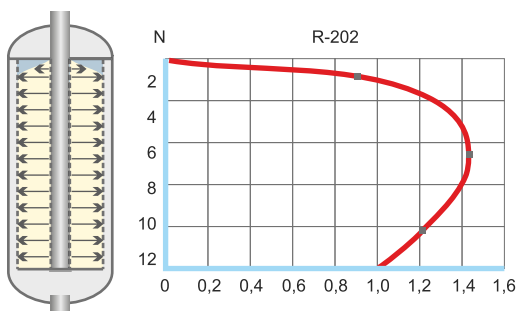


In 1997 the REEFING company worked out documentation (Patent #2124937) and made a kit of internals for the reforming reactor R-202 of the L35-11/1000 facility with radial flow going through the centerpipe equipped with a slot screen at the request from the Novo-Ufimski NPZ. The reaction products come out through scallops and a ring collector into an outlet choke. The technical decision enlarges volume of the catalyst loaded into the reactor and makes its operation more efficient over the layer height without any extra components: upper covers, flexible membranes and other devices.

Rational utilization of the catalyst increases a blend octane number and output of the reformed medium. The similar filling scheme was applied in reactors R-603, R-604A, R-604B of the LCh-35-11/600 facility (Ryazanski NPZ) in 2005 and in reactors R-2, R-3, R-4 of the L35-11/300 facility (Saratovski NPZ) in 2006 and in reactor R-5a of the LG-35-11/300-95 facility (Ukhtinski NPZ) in 2007.

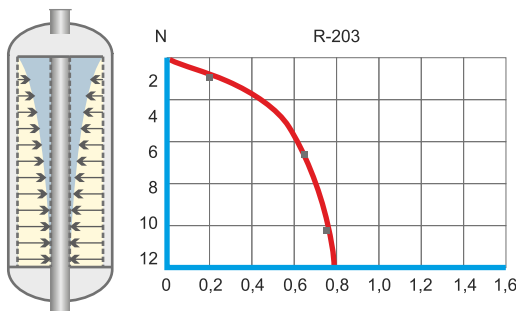


Curves of velocity distribution in reactors R-202, R-203, R-204 of the L-35-11/1000 facility.



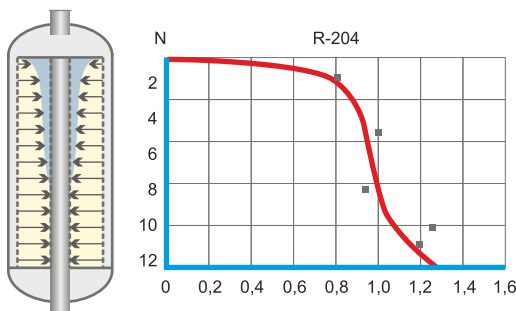
Distribution of the linear velocity profile and temperature gradient across the R-202 reactor height 1st reforming stage (as analyzed the nonworking zone is 8.9%).

$$\frac{t_{BX} - t_N}{t_{BX} - t_{BbX}}$$



Distribution of the linear velocity profile and temperature gradient across the R-203 reactor height 2nd reforming stage (as analyzed the nonworking zone is 17.5%).

$$\frac{t_{BX} - t_N}{t_{BX} - t_{BbX}}$$



Distribution of the linear velocity profile and temperature gradient across the R-204 reactor height 3rd reforming stage (as analyzed the nonworking zone is 22%).

$$\frac{t_{BX} - t_N}{t_{BX} - t_{BbX}}$$

The velocity curves graphed using data on the temperature fields prove high efficiency of the reconstructed reactor R-202.

The system efficiency and financing spent for its design are in high dependence from the screen design.

We propose screens with a ∇ -shaped profile considered to be the most advanced in a list of the available screens.

The slot screen design is a grid comprising the high-accuracy ∇ -shaped profile (longitudinal components) and cross support rods (ribs) welded in each point of intersection. Thus, the ∇ -shaped profile gives a flat rigid screen with longitudinal slots of strictly defined size (a slot can be from 30 μm) with the narrow tolerance range, while the support brackets form the screen load-carrying base.

Unlike conventional screens from the plaited meshes, presence of the slot screens in combination with implemented technical decisions allow us to:

- eliminate the catalyst breakup and the catalyst fines, reduce expenditures for the catalyst;
- exclude the filter jams, since the catalyst particles contact with it in two points on the ∇ -shaped profile sharp edges making the filter absolutely transparent for gas and the coke dust;
- evenly distribute the raw flow across the reaction zone;
- eliminate any dead zones in the catalyst layer and reduce the regeneration time;
- low a rate of increase in the pressure drop inside the reactor during

the interregeneration period, thus, enlarging the interregeneration period and the reactor life time as a result;

- improve the product quality;
- increase life time of the internals (up to 10 and more years).



Implementation of the slot screens clears the way for new catalysts with larger reaction surfaces at the same volume due to reduced dimensions of particles and also gives rise in the reactor production capacity and improve quality of the products.

During or after production the screens can be exposed to etching, passivation, annealing or other treatment processes with the goal to increase their resistance to corrosion and mechanical strength.

The slot screens provided by the [Johnson Screens](#) company (France) are used as blanks for production of kits of the internals.

INTERNALS FOR REACTORS OF HYDROFINING, HYDROCRACKING WITH AXIAL FLOW

All equipment is made of stainless steel 12Cr18N10T, 08Cr18N10T (AISI 321).

Trays, grids, rings and a basket are sectional. They are assembled, when installed inside the reactor. Size of the connecting tube in the upper part of the reactor are dimensioning for the tray and grid panels, the ring sectors, the support beams and the basket elements.

The trays and grid have such a design that a manhole hatch is

formed in their central part. The manhole hatch permits removing the central panels without disassembly of the whole tray and having access to the reactor bottom, if needed.

The panels are fixed with special fasteners, never threaded, to the internals support beams and the reactor support rings. The fixation scheme eases assembly and, especially, disassembly of the internals. Joints between the support surfaces of the panels and beams as well as the pan-

els and the support rings are sealed with flat gaskets, while gaps between cylindrical surfaces are filled with a rope packing.

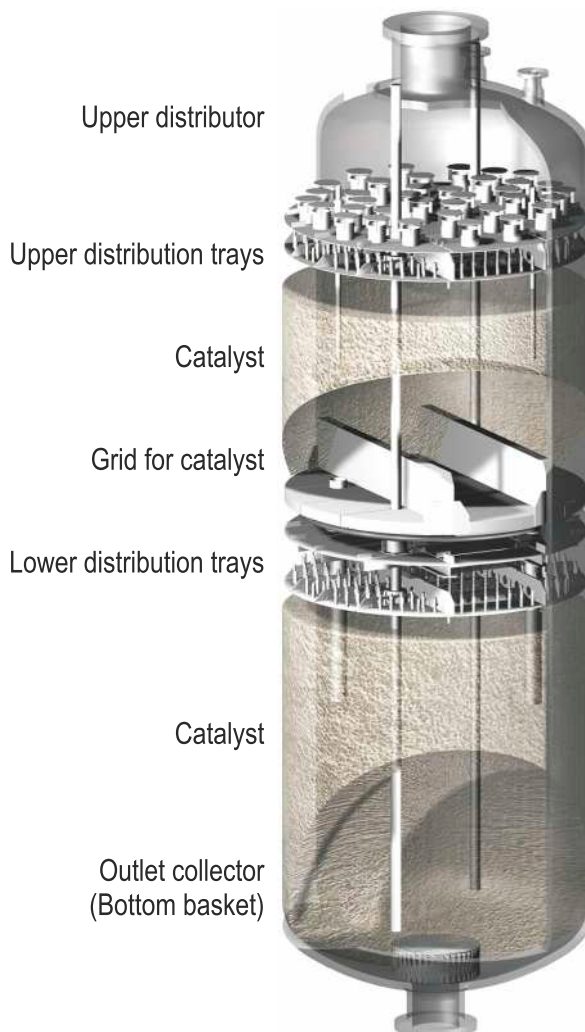
The gaskets and packing are made of adhesive fiberglass and ceramic fiber, correspondingly.



For the first time in Russia and CIS two kits of internals for reactors 3-R2001 and 3-R2002 of facility for hydrofining of the vacuum gas oil 5.5 m in diameter were produced and provided by the REEFING company. The hardware was ordered by the Lukoil-Nizhnegorodnefteorgsintez (Kstovo). The provided kit consists of:

- Upper distributor
- A set of beams for the catalyst supporting grid
- A set of panels for the catalyst support grid
- Outlet collector

The sets of panels for the catalyst support grid and the outlet collectors were fabricated by the [Johnson Screens](#) company (France).



INTERNALS FOR REACTORS OF HYDROFINING OF VIRGIN DIESEL FUEL

As a rule the equipment is provided in kits. The kit specification is per the Customer's request.

Each kit comprises:
an inlet device;
a distribution tray;
a bottom basket.

The kit is additionally completed with fixture for assembly and fastening inside the reactor as well as gaskets to seal the joints during installation.

A kit of internals prepared for installation can be placed inside the reactor within two-three days.

The REEFING produced internals are installed inside the R-5, R-2N (in 2002), R-1, R-3 (in 2005), R-4N, R-6N (in 2006) reactors in facility L-24/6 (Slavneft'-Yaroslavlnefteorgsintez).



All produced elements for the internals pass intensive fit checks on the reactor mock-up.

The products are accepted by the Customer's representatives at the REEFING premises.

The panels are fixed with special fasteners, never threaded. The fixation scheme eases assembly and, especially, disassembly of the internals.

The bottom basket screens made by the [Johnson Screens](#) of the ∇ -shaped profile reduce flow resistance at the reactor exit and prolong its life time.

INTERNALS FOR REACTORS OF ISODEWAXING OF MINERAL OILS

The equipment is made of stainless steel 12Cr18N10T, 08Cr18N10T (AISI 321).

As a rule the equipment is provided in kits. The kit specification is per the Customer's request.

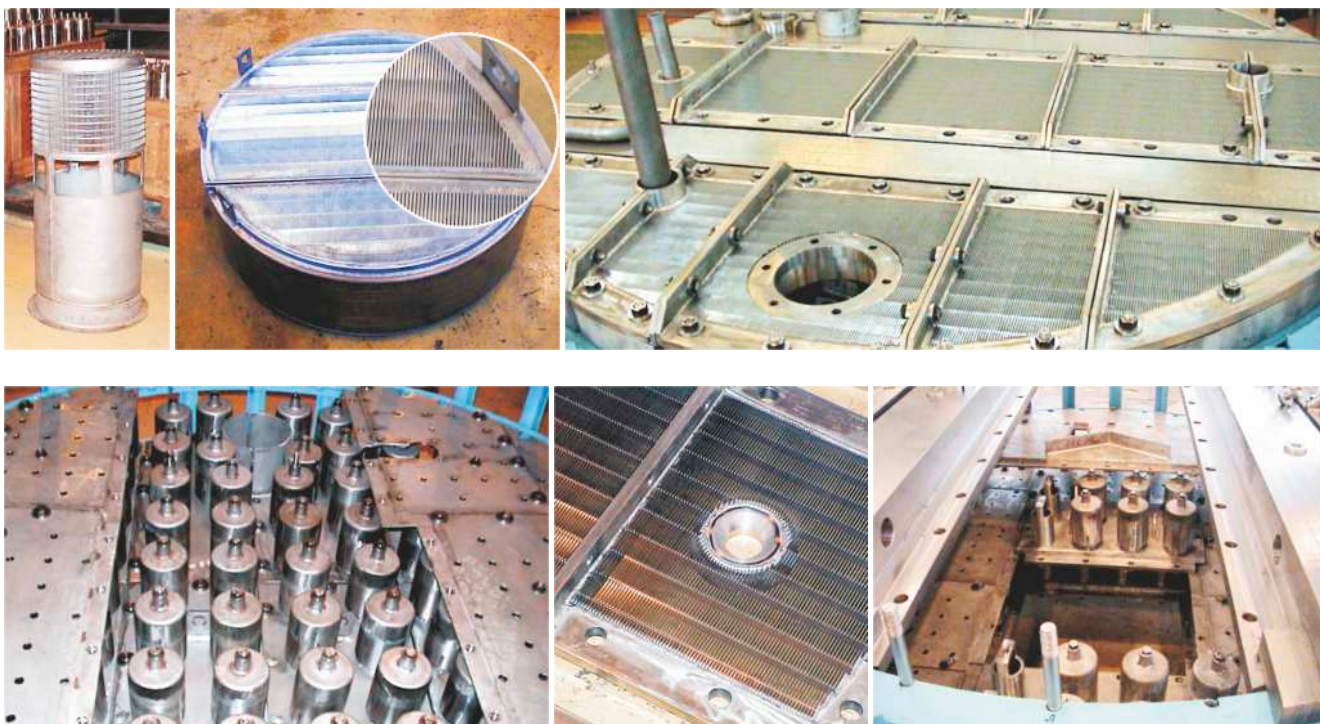
The kit consists of:

- an upper distributor;
- an upper perforated tray;
- an upper bubble tray;
- a grid for catalyst with support beams;
- a collecting tray;
- an inlet and quench pipe;
- a lower perforated tray;
- a lower bubble tray;
- a bottom basket.

The kit is additionally completed with fixture for assembly and fastening

inside the reactor as well as gaskets to seal the joints with the thermal couples cylinder during installation. The REEFING produced internals (in 2001) are mounted in the R-201A reactor of the KM-3 facility at the "Lukoil-Volgogradneftepererabotka».

Screens for the catalyst grid are made of the [Johnson Screens](#) - produced ∇ -shaped profile



The [Johnson Screens](#) - produced screens of the upper distributor and the lower basket from the ∇ -shaped profile decrease the flow resistance at the reactor entrance and distribute it evenly.

All produced elements for the internals pass through intensive fit checks on the reactor mock-up at the REEFING premises.

The beams are made of a one-piece blank after ultrasonic inspection.

To get a technological path through the reactor trays the design makes provision for disassembly of a part of components forming a manhole hatch.

Our line product for reactors includes all types of the internals, screens and their components required for building of a system operating with maximum efficiency.

The equipment is made of stainless steel 12Cr18N10T, 08Cr18N10T, AISI 321.

Generally the equipment is supplied in sets. The set specification is per a Customer's request.



In 2003 the internals for a reactor for isomerizing of gasoline fraction of the LG 35-11/300 facility of the Khabarovski NPZ were manufactured.

In 2007 internals for two reactors to be used for isomerizing of gasoline fractions of the Izoriforming facility at Ufimski NPZ were produced, and in 2008 - for three reactors of the Izomalk-2 facility of the Slavneft'-YANOS.

Since 2008 to 2012 we have supplied internals for Isomalk-2 units (per Neftechim company project) at OAO Slavneft'-YANOS, Saratov Refinery and Ryazan Refinery.

In 2008 and 2011 three sets of internals for isomerization reactors of PGI-DIG/280 units per Axens project have been delivered to Syzran Refinery, Kuibyshev Refinery and Novokuibyshevsk Refinery.

INTERNALS FOR REACTORS OF THE VACUUM GASOIL HYDROFINING

The equipment is made of stainless steel 12Cr18N10T, 08Cr18N10T (AISI 321).

As a rule the equipment is provided in kits. The kit specification is in compliance with the Customer's request.

The complete kit for each reactor includes:

- an upper distributor;
- a protective tray;
- a tray for superfine distribution;
- a bottom basket.

Sets of internals prepared for installation can be fixed in the reactor within three-four days.



Check assembly of distributing trays on the reactor mock-up 3.6 m in diameter.



The bottom basket equipped with a wedge profile, which screen was produced by the [Johnson Screens](#) company



Upper distributor with perforated distributors

We have developed our own methodology to analyze parameters of the reactor internals and, above all, of the tray for superfine distribution. Within the framework of the activity we performed competitive tests of nozzles of different trays for superfine distribution of our design and designs of foreign firms. The testing were performed on a hydrodynamic stand, all nozzles were exposed to similar environment, and the tests proved that our nozzle ensured more even distribution of the gas flow in the gap between the tray and the catalyst and

maximum efficient utilization of the catalyst layer. Thus full and uniform wet-out of the whole catalyst surface is achieved. The nozzle design eliminates any jams and ensures optimum operation of the tray for superfine distribution.

A combination of analytical and experimental activities confirmed functionality of the newly designed nozzle.

The design was used as a baseline for the first project of internals for the L-24/5 facility (Uralneftechim JSC) producing 1.5 mln tons per year,

worked out and realized in 2004. The facility is featured by a two-flow scheme - 3 reactors in one flow and 3 other reactors – in the other flow. Reactors of one flow are filled with a foreign catalyst, whilst others are filled with a catalyst developed by the KATACHIM company and produced by the Promkataliz company.

INTERNALS FOR REACTORS OF HYDROFINING OF GASOLINE FRACTION OF THE GAS CONDENSATE

The equipment is made of stainless steel 12Cr18N10T, 08Cr18N10T (AISI 321).

As a rule the equipment is provided in kits. The kit specification is in compliance with the Customer's request.

The complete set for each reactor contains:

an upper distributor;

a protective tray;

a tray for superfine distribution;

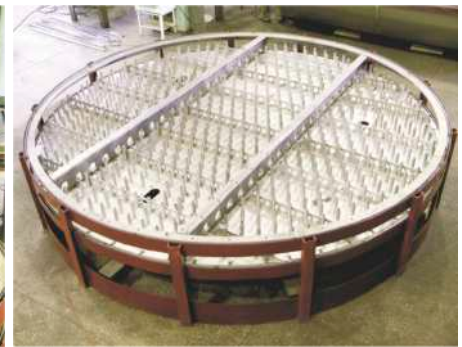
a lower basket.

The kit is additionally completed with fixture for assembly and fastening inside the reactor.

Kits of internals prepared for installation can be placed inside the reactor within one-two days. In 2005 the REEFING-produced internals were installed in the R-1 reactor of the GO-4 facility for hydrofining of gasoline fraction of the gas condensate at the "Salavatnefteorgsintez" JSC. The catalyst was developed by the

KATACHIM company and made by the the Promkataliz company.

The tray for superfine distribution is equipped with the REEFING-produced tube distributors analogous to the ones worked out under the project of the L-24/5 facility of the Uralneftechim JSC.



Distributors of gas-and-liquid sprays for superfine distribution (Patent #2281804)



INTERNALS FOR REACTORS FOR CATALYTIC DEHYDROGENATION OF ETHYL BENZENE INTO STYRENE

In July 2004 the REEFING company made two sets of internals for reactors of the first and second stages for a facility of catalytic dehydrogenation of ethyl benzene into styrene at the Sibur-Khimprom JSC (Perm) under an order from IK ZIOMAR JSC (Podol'sk). The internals are made of stainless steel 12Cr18N10T.

The complete set includes:
- a centerpipe (outer diameter - from 1125 to 1300 mm, length - 5400 mm);
- an outer basket (inner diameter - from 3150 to 3200 mm, height - 5400 mm).

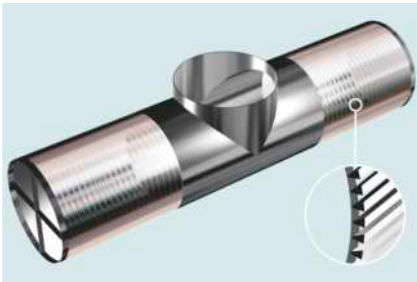
The centerpipe is made of a perforated tube and a slot screen. The outer basket comprises 3 sections of the roll-form slot screen with mating flanges. Flat blanks for the slot screens are produced by the [Johnson Screens](#) company (France).



FILTERS TO CLEAN THE RECYCLED WATER FROM MECHANICAL IMPURITIES

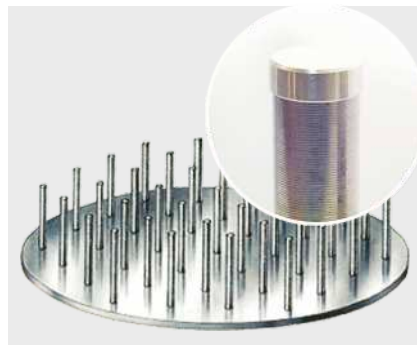
A prime filter is designed to filter the recycled water upon its utilization for production purposes in various facilities.

The filter flow rate is 1200 m³/h. All components are made of stainless steel. Size of the filtering slots made of the ∇-shaped profile is 2 mm. The prime filter prototype was made for the Novoufimski refinery in 1997.



A final filter is designed to filter the recycled water upon its utilization for production purposes in various facilities.

The filter flow rate is 320 m³/h. All components are made of stainless steel 12Cr18N10T. Size of the filtering slots made of the ∇-shaped profile is 0.2 mm. The water work pressure does not exceed 0.4 MPa. The final filter prototype additionally equipped with a scraping worm was made for the Novoufimski refinery in 1997.



OIL FILTERS

A cylindrical oil filter comprises a spiral slot screen from the [Johnson Screens](#) - produced of ∇-shaped profile and an adapter welded to it. The slot size is 30 μm. The filter complete kit is formed from modules, the number of modules depends on operational conditions of a concrete technological facility. The filters are mounted on a membrane of the technological tank separating dirty products from pure ones.

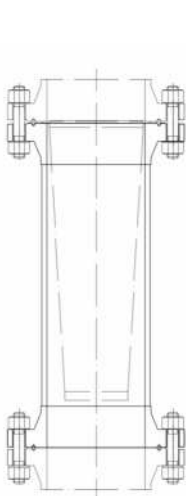
FILTERING FLOORS

Floors to filter adsorbers V-501-D1, D2 on the basis of flat screens from the ∇-shaped profile were produced by the REEFING company in 2004 and implemented at the Mozyrski NPZ JSC with the purpose to ensure even distribution and low flow resistance through the adsorber.

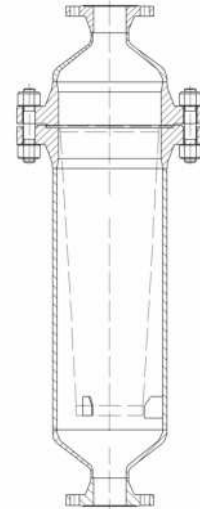
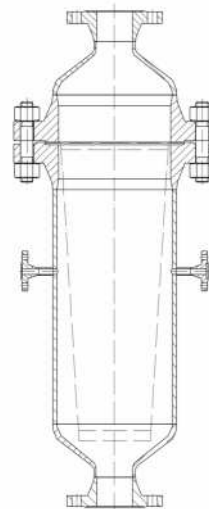
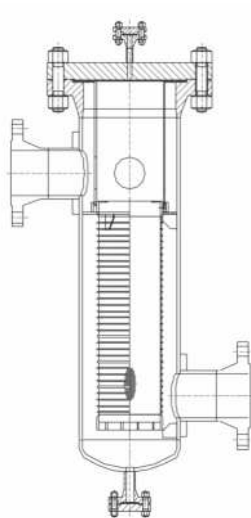
Our team has developed various designs and analytical methodologies (strength, gasdynamic) of filters (protective elements) for heat exchangers. Conical and cylindrical filters with slot screens form the ∇-shaped profile applied in inlet lines for gas mixture and raw flow of the Packinox type heat exchangers, are produced by the REEFING company under its documentation. The filters permit to remove any contamination in beams of the heat exchangers, thus, significantly increasing their life time. And the proposed scheme with two filters placed in parallel in one raw inlet line will guarantee the

exchanger nonstop run in repairs of one of the filters. Filters for the heat exchangers were implemented at: Novoufimski NPZ (1997), Angarsk oil-and-gas company (1999), Slavneft - Yaroslavnfteorgsintez (2000, 2001, 2004), PO KINEF (2002), Syzranski NPZ, Tuapsinski NPZ and Lukoil-Volgogradneftepererabotka (2003), Mozyr'ski NPZ, Odesski NPZ, Ukhtinski NPZ, Permnefteorgsintez (2004), Chikmenski NPZ (2006), Ukhtinski NPZ. Cases of the catalyst escape (up to 200 kg) from the last reforming reactors are well known to us, against

the background our filters proved their functionality and prevented entry of the catalyst inside the Packinox type heat exchangers. Reports from the refineries using the filters confirm the fact.



Filter for gas mixture



Filters for hydrogenation product

The REEFING-delivered filters are designed to filter different liquids (hydrogenation product, solutions of monoethanol amine and monodiethanol amine, liquid fuel) and gas (gas products mixture, fuel gas) mediums at oil refineries. The filtering surfaces are formed with slot screens. The slot screen design is a grid comprising the high-accuracy ∇-shaped profile (longitudinal components) and cross support rods (ribs) welded in each point of intersection. Thus, the ∇-shaped profile base gives a flat surface where

products of corrosion and mechanical particles are held, while openings between the profiles – slots - guarantee free passing of a refined product, since they are widened as go off the filtering surface. The slot screen structure allows us to comply with the most rigid requirements imposed to performance of the filter elements. They are:

- minimum hydraulic friction;
- less effect of the filter jams, since the catalyst particles contact with it in two points on the ∇-shaped profile sharp edges;

- less labour-intensiveness in restoration of the filtering element (cleaning, washing);
 - increased time period of operation of the filter element in-between to its regular cleans;
 - reliability of the filtering element in operation;
 - life time of the filter element – up to 10 and more years.
- The REEFING company produces filters with up to 30 µm-slot.



For processes asking for heat exchanger application we recommend to use the lamellated beams. The lamellated beams of an exchanger have better performance in comparison with the tube beams of the same size: the heat exchange surfaces increased more than in 3 times.

If the system has to be modified, we suggest equipping the existing heat exchangers with lamellated beams.

The lamellated beams proposed by the REEFING company (Patents 2137998, 2211423) are assembled from sheets of the corrosion-resisting steel 1.2 mm thick with forges on the plate fields. The working body temperature is up to 450°C, pressure drop between mediums is up to 14 kgf/cm². The working body is a mixture of products of diesel fuel and hydrogen-bearing gases. The REEFING-designed and

produced lamellated beam 6500 mm in length and 1240 mm in diameter for the E-303V heat exchangers of the Zheksa combined facility for refining the diesel fuel at the Novoufimski NPZ was working from May 2001 to 2007.



A lamellated beam for the E-303V heat exchangers is welded from 105 pairs of plates equal in width and weights 16400 kg. The heat exchanger surface area is 1415 m². The equipment is completed with an installation-transport support.

DROPPING LIQUID BAFFLES

The dropping liquid baffles are a mass exchange preformed packing designed to separate liquid appeared in gases.

The dropping liquid baffles are made in the form of module packages looking like a rectangular prism of different dimensions. The package is formed from corrugated plates with rents (like louver) housed in a frame. The plates with rents are made of the stainless steel, 0.3 - 0.5 mm thick. When installed, the column orifice is assembled from packages to ensure the required layer thickness and diameter.

Efficiency and universality of the dropping liquid baffles make them the most suitable for the following

apparatus:

- separators;
- extraction columns;
- other mass exchangers.

The orifice efficiency is achieved with: a special rent pattern; plates are corrugated at an angle relative to the rents; corrugated plates are stuck in the package in a certain order. Packages of the dropping liquid baffles have been mounted and put in operation in the E-12 gas separator (used in the sulphur production facility) and the S-5 gas separator of the L-35-5 at Ufimski NPZ JSC since 2000.

Implementation of the dropping liquid baffles permits excluding:

carry-over of the dropped liquid with sulphuretted hydrogen; damage of the waste heat boiler pipelines.

Compressors PK-1-7 started working steadily. No pressure drops are observed on the the dropping liquid baffles.

In 2007 packages of the dropping liquid baffles were delivered to Mozyrski NPZ JSC for nine separators of facilities LK6u 1. In 2008 packages of the dropping liquid baffles were delivered to Mozyrski NPZ JSC for htree separators of facilities LK6u 2.



Cut out corrugated plate. Package from corrugated plates

COLUMN ENTHALPY EXCHANGER INTERNALS

Being a partner with GTC Technology REEFING offers column enthalpy exchanger internals.

Since 1994, GTC has provided specialized process equipment technology solutions that cover a broad spectrum of conventional and proprietary mass transfer equipment designs for trays, packing and other tower internals. All of our trays are designed to achieve optimum capacity and efficiency and our technology applies fundamental principles such as liquid gradient elimination, static head control, plug flow optimization, vapor dispersion injectors, optimum vapor-liquid distribution, liquid flux management and anti-fouling capabilities.

GT-OPTIM™ High Performance Trays

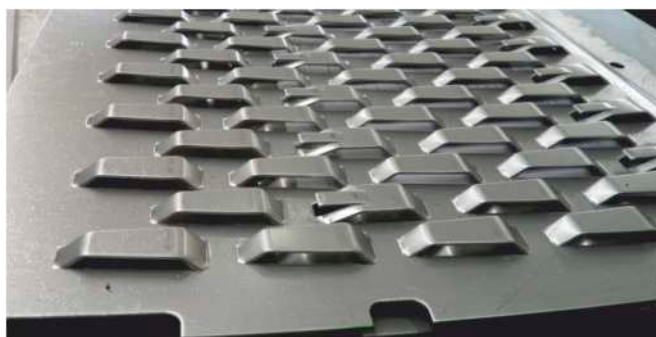
Beside wide range of conventional trays GTC also offers GT-OPTIM™ trays. GT-OPTIM is a state-of-the-art high performance tray that has been commercially proven to achieve efficiency and capacity improvements over conventional trays, providing a faster return on investment. GT-OPTIM cross-flow trays are customized to our clients' needs to achieve the highest efficiency in refinery, petrochemical and chemical applications. A combination of patented and proprietary devices make up each tray design, specific to each application.

Structured Packing

GTC Technology's structured packing is designed to help clients achieve higher capacity, higher efficiency and lower pressure drop. When selecting structured packing, we advise our clients to consider several parameters that influence the performance of the equipment including crimp height, crimp inclination angle, element height, surface treatment, fouling tendency, system properties and service. Our corrugated sheet structured packing, the industry standard clients have come to expect, can be modified through the packing geometry, surface treatment and manipulation of variables in order to increase efficiency and capacity.



GTC Technology completed one of the largest structured packing installations in the world with a tower diameter in excess of 15 meters.



Picture above shows an active panel of a valve tray with GT-mFIX™ proprietary valve type.

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