NIIK, R&D
INSTITUTE
OF UREA

FROM TECHNOLOGICAL SOVEREIGNTY TO TECHNOLOGICAL LEADERSHIP

НИИК

COMPREHENSIVE SOLUTIONS FOR THE FERTILIZER INDUSTRY

July 2025

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- ✓ EQUIPMENT AFTERSALES SERVICES
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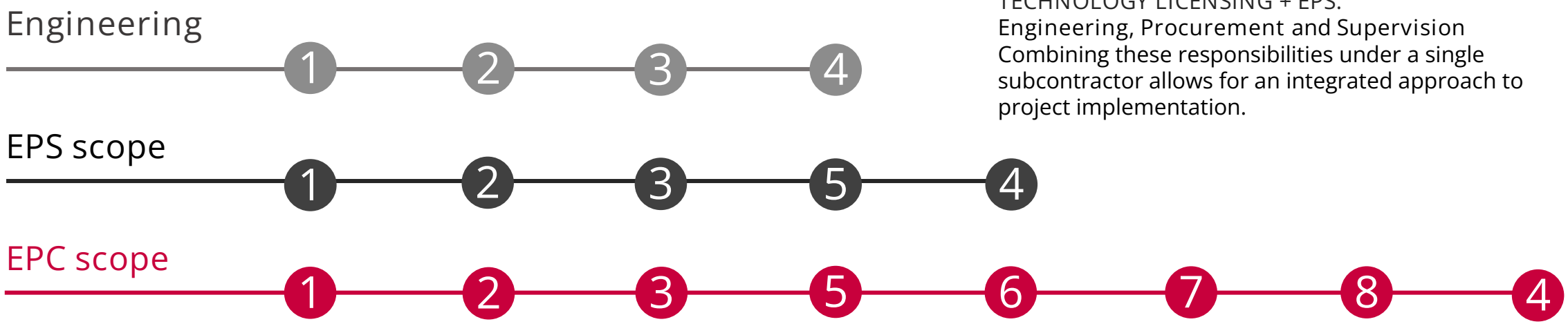
BUSINESS MODEL, PROJECT ROAD MAPS



NIIK BUSINESS MODEL

TECHNOLOGY LICENSING + EPS:
Engineering, Procurement and Supervision
Combining these responsibilities under a single subcontractor allows for an integrated approach to project implementation.

1. Pre-project Engineering & licensing
2. Project Engineering
3. Field supervision
4. Operation documentation and manuals
5. Material and Equipment Procurement. Equipment Manufacture Supervision
6. As built Documentation
7. Construction and assembly
8. Construction Supervision

PRODUCTS AND SOLUTIONS

- R&D
- TECHNOLOGY LICENSING
- DESIGN & ENGINEERING
- EQUIPMENT DESIGN AND PROCUREMENT
- EQUIPMENT AFTERSALE SERVICES
- TESTING FACILITY

- UREA
- AMMONIA
- MELAMINE
- NITRIC ACID
- AMMONIUM NITRATE
- METHANOL
- UAN
- AUS 32
- ANHYDROUS CALCIUM NITRATE
- COMPOUND FERTILIZERS

BUSINESS FOUNDATION - DEMAND FOR RUSSIAN GAS CHEMICAL AND MINERAL FERTILIZER TECHNOLOGIES

Key demand drivers

NEED FOR GAS MONETISATION

The significant decline in pipeline exports of natural gas is stimulating the search for ways to effectively process it in the country

INVESTMENT ATTRACTIVENESS

Investment projects in gas chemical and mineral fertilizer production have short payback periods if state support mechanisms are used

LIMITED LICENSING MARKET

‘Conventional’ western licensors do not provide technologies to Russian enterprises

TECHNOLOGICAL SOVEREIGNTY

Dependence on Chinese licensors requires the development and application of Russian licenses to ensure the technological sovereignty of the country

NIIK - TECHNOLOGY AND ENGINEERING DEVELOPMENT CENTRE

RESEARCH, DEVELOPMENT AND LICENSING OF TECHNOLOGIES

Over 110 proprietary patents

DESIGN ENGINEERING, EQUIPMENT SUPPLY, SUPERVISORY ENGINEERING

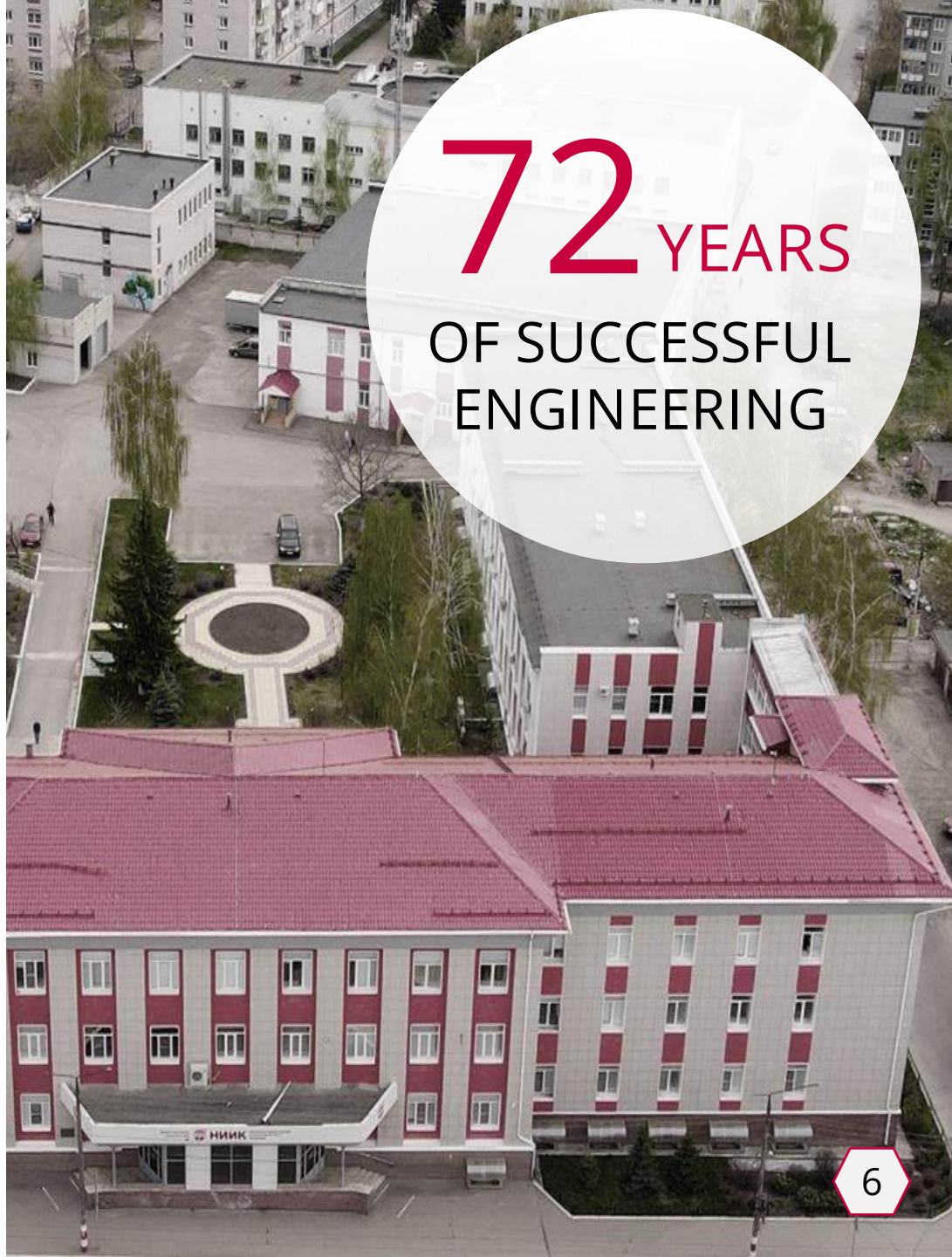
Over 490 completed projects

COMPETENCES ARE A KEY VALUE

Over 500 employees across 5 locations

MARKET RECOGNITION

Over 120 Customers in Russia and worldwide



RESEARCH AND DEVELOPMENT, TECHNOLOGIES LICENSING

RESEARCH, DEVELOPMENT AND TECHNOLOGY LICENSING

Technology readiness levels according to GOST R 58048-2017 / ISO 16290:2013

TRL	STAGE	KEY ACTIONS	EXPECTED RESULTS
1	Idea	Generation of basic concept. Initial search of patents, literature, general information	Formed hypothesis and general idea of the process
2	Concept formation	Preliminary risk assessment, drawing up an enlarged block diagram, approximate balances	Conceptual scheme and balances, basic equipment assessment, risks
3	Proof of concept	Laboratory initial small-scale tests of catalysts, selectivity, kinetics	Confirmation of operability on laboratory equipment
4	Preliminary design	Extended experiments. Compilation of a “short” process model, definition of blocks	Refined optimal reaction modes, primary model is validated
5	Detailed design	Extended flowchart. Preparation for pilot plant: documentation, equipment specification	Verified reaction modes, process model, documents for transition to pilot
6	Pilot testing	Establishing a pilot plant (2-5% of design capacity)	Proven process replicability, validation of parameters. Initial data for FEED/PD
7	Operational testing	Establishment of the experimental-industrial plant (5-20% of the design capacity). Development of FEED/Main design solutions/PD	All parameters verified. FEED/Main technical solutions, PD and design and engineering documentation for equipment, cost estimates and financial model
8	Full-scale plant	Manufacture of equipment, procurement and delivery, construction and installation, erection supervision, commissioning of the plant of design capacity	Start-up, reaching design performance, validation of costs and metrics
9	Full-scale operation	The plant is in continuous operation. Real proof of efficiency.	Sustained, competitive plant operation, ready to scale up to new capacities

NIIK CORE TECHNOLOGIES

TRL9

UREA PROCESS

- URECON® 2006
- URECON® stripping 3000

Reconstruction of existing plants and construction of new plants up to 3 100 mtpd

TRL9

NITRIC ACID PROCESS

- UKL-7 and UKL 7-76M
- AK-72 and AK-72M

Reconstruction of existing and construction of new units

TRL9

AMMONIUM NITRATE PROCESS

Revamp of existing plants and construction of new plants with capacity from 30 to 100 mtph

TRL9

UREA-AMMONIUM NITRATE PROCESS

- UAN from ammonia
- UAN from gas vents of the urea shop
- UAN from ready-made solutions

TRL9

COMPOUND FERTILIZERS PROCESSES

Fertilizers with different nutrient ratios (HSDG)

TRL9

AUS 32 UREA SOLUTION PROCESS

32.5% urea solution Ad Blue process and for treatment of diesel exhaust gases using SCR process technology

NIIK CORE TECHNOLOGIES

TRL3

UREA PROCESS

- URECON® Stripping 4000

Reconstruction of existing plants and construction of new plants with over 4 000 mtpd capacity

TRL4

MELAMINE PROCESS

Melamine process with a capacity of up to 40,000 tpa

TRL7

ANHYDROUS CALCIUM NITRATE PROCESS

Anhydrous calcium nitrate process up to 120 000 tpa

TRL4

AMMONIA PROCESS

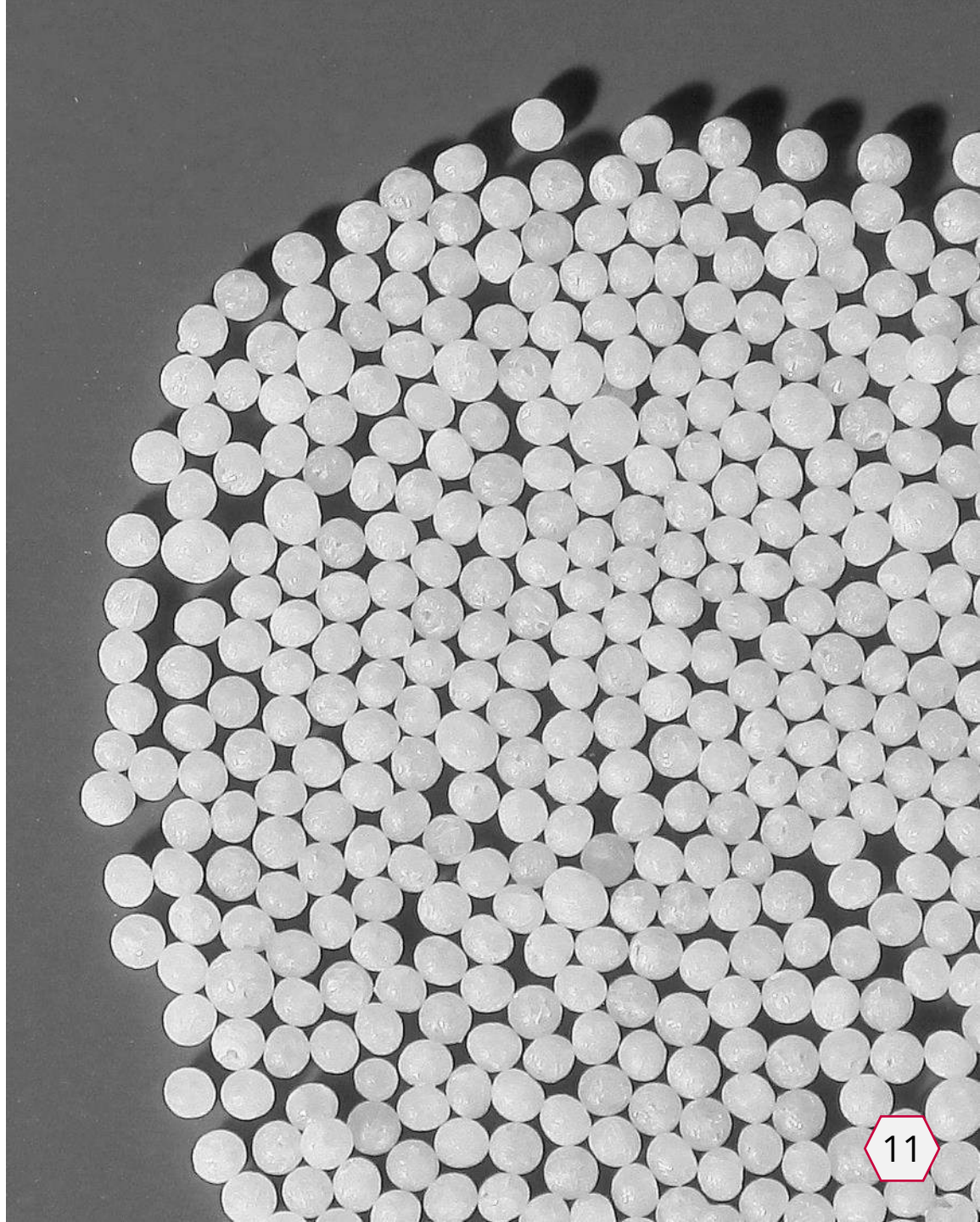
Reconstruction of existing plants and construction of new plants with a capacity of up to 2 400 mtpd

TRL4

METHANOL PROCESS

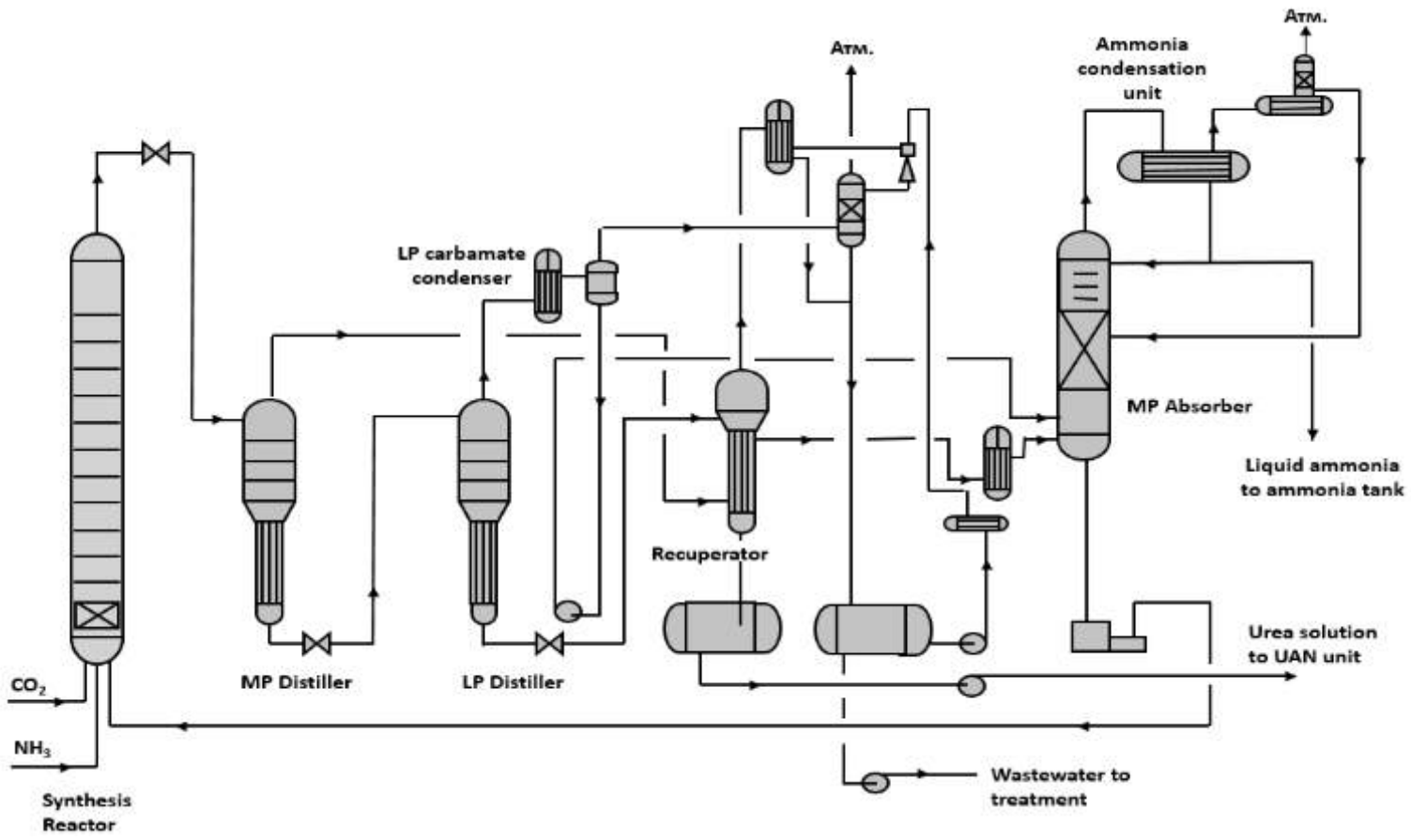
- Low-capacity methanol process M15
- Large-capacity methanol process M550

COMMERCIAL GRADE UREA: NIIK PROCESSES



LICENSED TECHNOLOGIES

URECON® 2006 PROCESS



SMALL SCALE LIQUID RECYCLE UNITS WITH CAPACITY UP TO 800 MTPD

Urea synthesis unit includes a high-pressure vessel with three solution inlet nozzles. Urea synthesis unit operates at 200 atm pressure.

Two-stage distillation with key vessels of proprietary design – MP and LP Decomposers (patented).

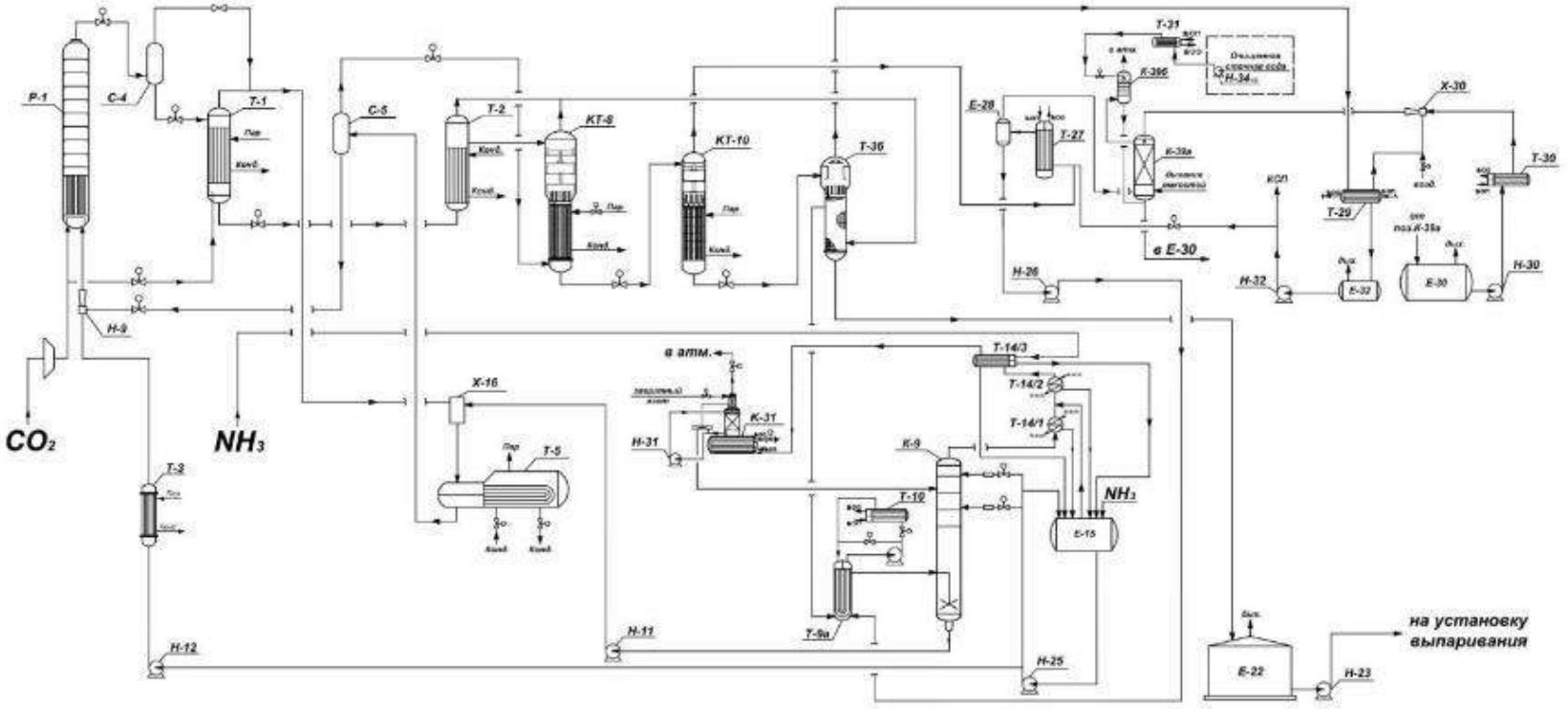
TECHNOLOGY READINESS LEVEL TRL 9 ACCORDING TO ISO 16290:2013

LICENSED TECHNOLOGIES

URECON® STRIPPING 3000 PROCESS

BY ORDER OF THE CHAIRMAN OF THE GOVERNMENT OF THE RUSSIAN FEDERATION MIKHAIL MISHUSTIN URECON® STRIPPING 3000 PROCESS WAS INCLUDED IN THE LIST OF MODERN TECHNOLOGIES FOR THE CONCLUSION OF SPECIAL INVESTMENT CONTRACTS (SPIC 2.0)

THE SPIC SCHEME WILL FACILITATE A RUSSIAN DEVELOPER / INVESTOR TO RECEIVE GOVERNMENT SUPPORT AND DRASTICALLY INCREASE THE INVESTMENT ATTRACTIVENESS OF ITS PROJECT



UREA STRIPPING PROCESS FOR LARGE-SCALE PLANTS WITH CAPACITY UP TO 3100 MTPD

This is an improved technology of stripping process in CO_2 current for units with capacity over 1 000 tons per day.

Thanks to the patented design, the efficiency of the synthesis unit increases in comparison with the conventional CO_2 stripping process. URECON Stripping 3000 process is regarded by NIIK for construction of new units with high capacity (up to 3 100 mtpd).

TECHNOLOGY READINESS LEVEL TRL 9 ACCORDING TO ISO 16290:2013

LICENSED TECHNOLOGIES

PRILLING TOWERS BY NIIK

SERVICES

- Revamps and modifications
- Turnkey design and construction of prilling tower

BENEFITS

- Wide capacity range
- Compact design
- Process efficiency
- Resource saving
- Cost-effectiveness
- Green operation

CHARACTERISTICS

- Monodispersity of composition (main fraction content - 95%)
- Large average prill size (2,5 - 3 mm)
- Prill cooling in summer period to 40-50°C
- High strength of prills in the obtained product (not less than 0.8 kgf/prill)
- Product resistance to mechanical impacts during transportation and storage
- Waste air purification from ammonia and urea dust: up to 50 mg/Nm^3 and 30 mg/Nm^3 respectively
- Guaranteed low energy costs for prilling process and air purification

TECHNOLOGY READINESS LEVEL 9 ACCORDING TO ISO 16290:2013

LICENSED TECHNOLOGIES

GRANULATION PLANT BY NIIK

SERVICES

- Development of all necessary documentation for the construction of a granulation plant
- Modernization of dust cleaning system of existing granulation plants

BENEFITS

- Wide range of capacities
- High product durability
- Process technological efficiency
- Ability to produce formulations with microelements

CHARACTERISTICS

- Large average granule size (over 3 mm)
- High granule durability of the resulting product (not less than 2.5 kgf/granule)
- High resistance of the product to mechanical impacts during transportation and storage
- Purification of exhaust air from ammonia and urea dust: up to 20 mg/nm^3 and 20 mg/nm^3 respectively (using acid recovery)

METHANOL PRODUCTION: NIIK TECHNOLOGIES

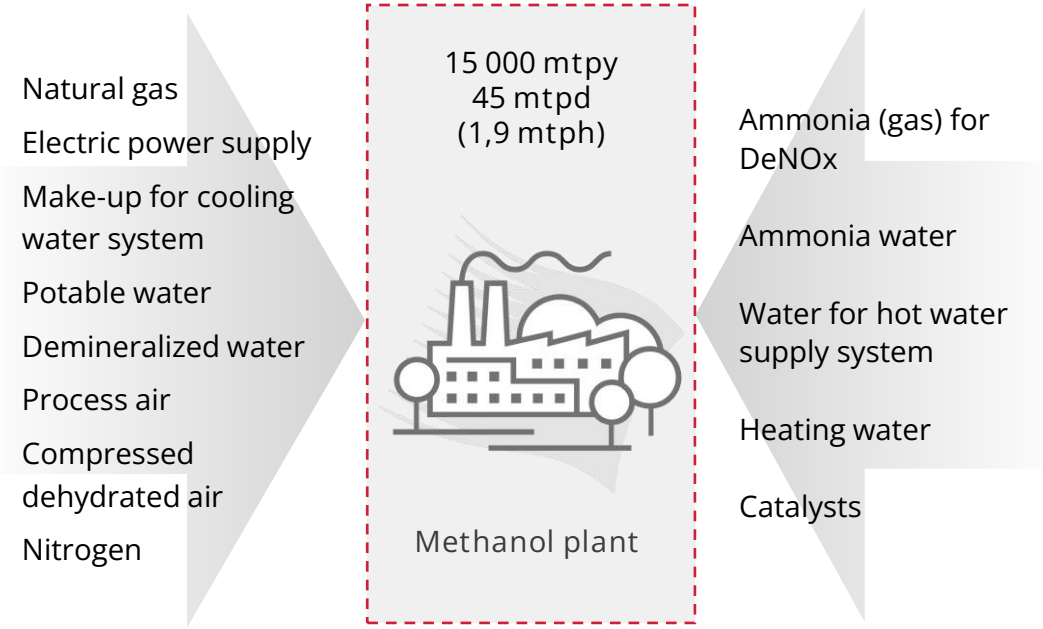
LICENSED TECHNOLOGIES

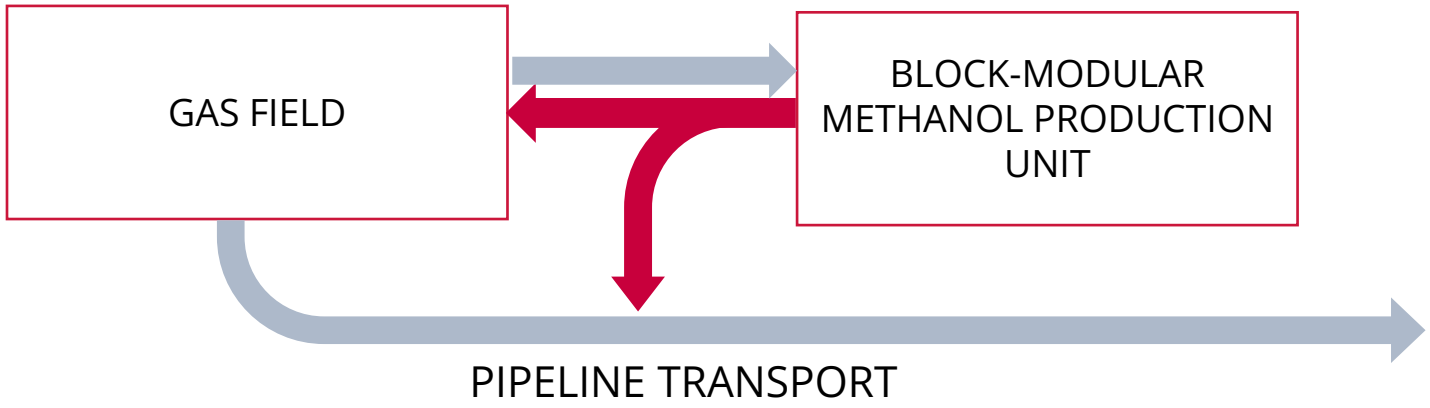
LOW-CAPACITY M-15 METHANOL PRODUCTION UNIT

PROTECTED BY PATENT NO. 2691073

PROVIDES UNIFIED SOLUTIONS FOR THE MAIN TECHNOLOGICAL STAGES OF PRODUCTION, METHANOL STORAGE AREA AND CAN BE APPLIED FOR ANY CONSTRUCTION SITE, INCLUDING THE REGIONS OF THE FAR NORTH

- Independence from site remoteness, weather and market conditions
- No transportation expenses
- Independence from third-party suppliers
- Possibility to use raw methanol and own source of feed stocks - natural or associated gas
- Flexible plant capacity control
- Reduced cost of the final product





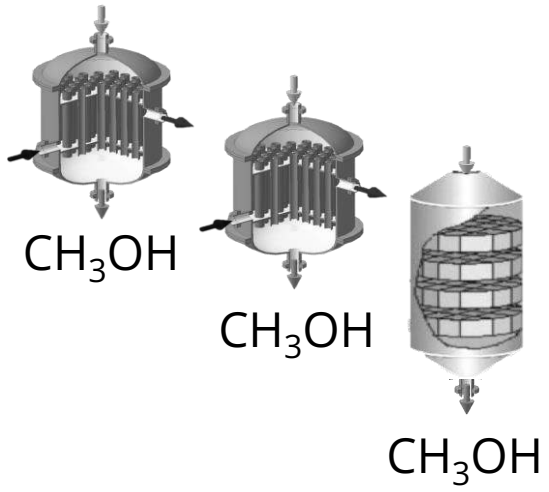
NIIK JSC's task is to solve the issues of providing all the necessary resources for the production facility under design during Project Documentation development.

LICENSED TECHNOLOGIES

METHANOL PLANT WITH A 550,000 T/YEAR CAPACITY

ADVANTAGES OF THE NEW M-550 PROCESS

- Increase of catalyst specific capacity
- Circulation rate in the last reactor is reduced to 2
- Energy consumption for circulation loop of the 3rd reactor are reduced
- High degree of carbon feedstock processing to methanol is achieved: more than 98% wt (compared to conventional 90% wt)
- Reduction of compressor equipment dimensions



M-550 TECHNOLOGY IS BASED ON DETAILED DEVELOPMENT OF A NEW DESIGN OF THE REACTOR UNIT OF THE SYNTHESIS SECTION AND OPTIMISATION OF HEAT RECOVERY OF PROCESS UNITS IN ACCORDANCE WITH THE TECHNOLOGY UNDER DEVELOPMENT.

LICENSED TECHNOLOGIES

HIGH-SPEED DRUM GRANULATOR (HSDG)

BENEFITS

- Small size
- Classification and recycle inside the drum
- Easy to place
- Small volumes of air
- Low capital and operational costs
- Wide range of capacities
- Flexibility of use

TECHNICAL AND ECONOMIC FEATURES

Item	Value
Capacity*, mtpd	250-500
Air, m^3/t	1300–2000**
Water, m^3/t	0–15**
Electricity, kWh/t	35
Moisture removal from 1 m^3, kg/h	30
Length, m	10,6
Diameter, m	2,5

* flow rate is determined by the type of granulated product

PRODUCTS

- Straight fertilizers
- Fertilizers with micronutrients
- Custom fertilizers with different ratio of nutrients

HSDG can produce wide amount of fertilizer types

AMMONIUM NITRATE: CONSTRUCTION AND REVAMP

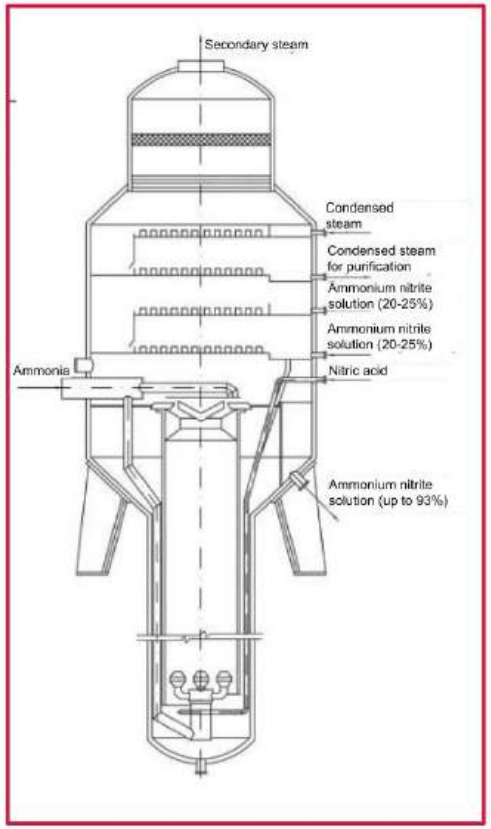
JSC NIIK offers solutions on using highly efficient equipment for ammonium nitrite melt neutralization and concentration stage with possibility to implement such solutions both during construction of new plants and revamp of the existing plants.

Ammonium nitrite solution production section

NIIK's solution:
Nitric acid neutralization takes place under pressure close to atmospheric pressure in a neutralization vessel using neutralization heat for solution evaporation.
Capacity: up to 30 t/h.

Characteristic features of the design:
- Natural circulation of the ammonium nitrite solution in the vessel
- In-built section for secondary steam purification

Advantages:
- high mixing degree of component flows
- safe operation in weakly acidic mode (1-4 g/l);
- minimal ammonia losses
- possibility of beneficial use of steam obtained in the vessel
- control of temperature and pH values of the obtained ammonium nitrate solution

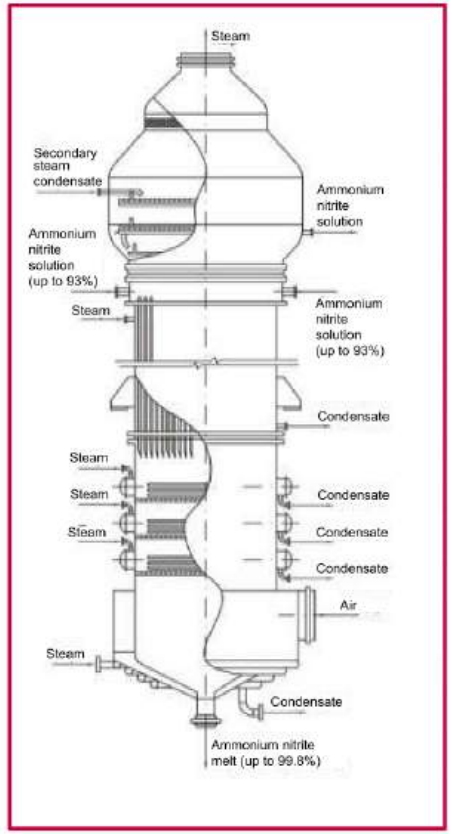


Ammonium nitrite solution evaporation section

NIIK's solution:
The offered design ensures obtaining the melt in the vessel with falling film

Characteristic features of the design:
- The evaporation vessel operates under a presser close to the atmospheric pressure. The ammonium nitrite solution moves in the form of thin layer on the external side of the vessel tubes. Heating of the ammonium nitrite solution to be concentrated is done both through heat-exchanging tubes by secondary steam heat and by hot air supplied by counter-flow to the tube side
- The vessel is equipped with a built-in system for purification of exhaust air

Advantages:
- obtaining ammonium nitrate melt with concentration of up to 99,7-99,8 %
- creation of vacuum is not required



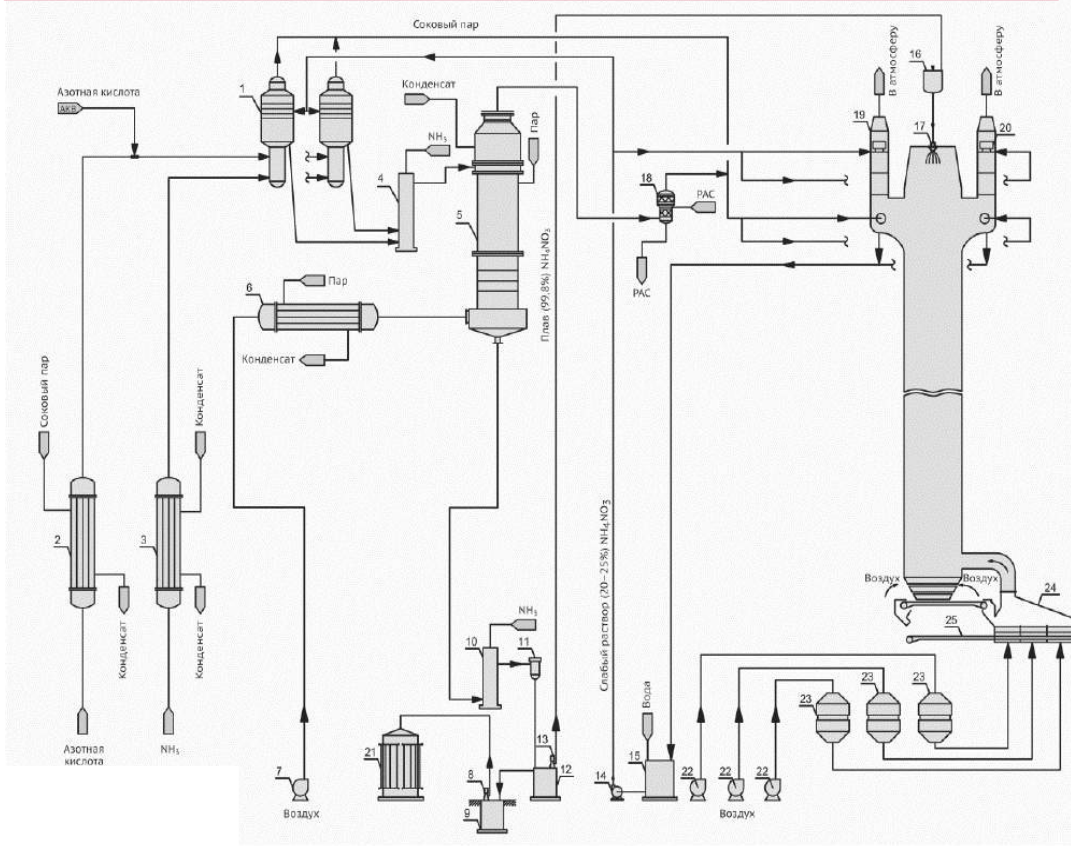
PROPRIETARY DESIGNS

AMMONIUM NITRATE: CONSTRUCTION AND REVAMP

Main process stages of this type of units:

- Neutralization of nitric acid with ammonia
- Evaporation of ammonia nitrate solution to a melt state
- Prilling in the tower

PRINCIPAL DIAGRAM OF AMMONIA NITRATE PRODUCTION



1. Neutralization reactor
2. Nitric acid preheater
3. Ammonia preheater
4. Final neutralizer
5. Evaporation vessel
6. Air preheater
7. Air blower
8. Pump
9. Melt drain tank
10. Hydraulic seal-Final neutralizer
11. Melt filter
12. Melt tank
13. Melt pump
14. Solution pump
15. Scrubber flushing liquid tank
16. Head tank
17. Granulator
18. Scrubber

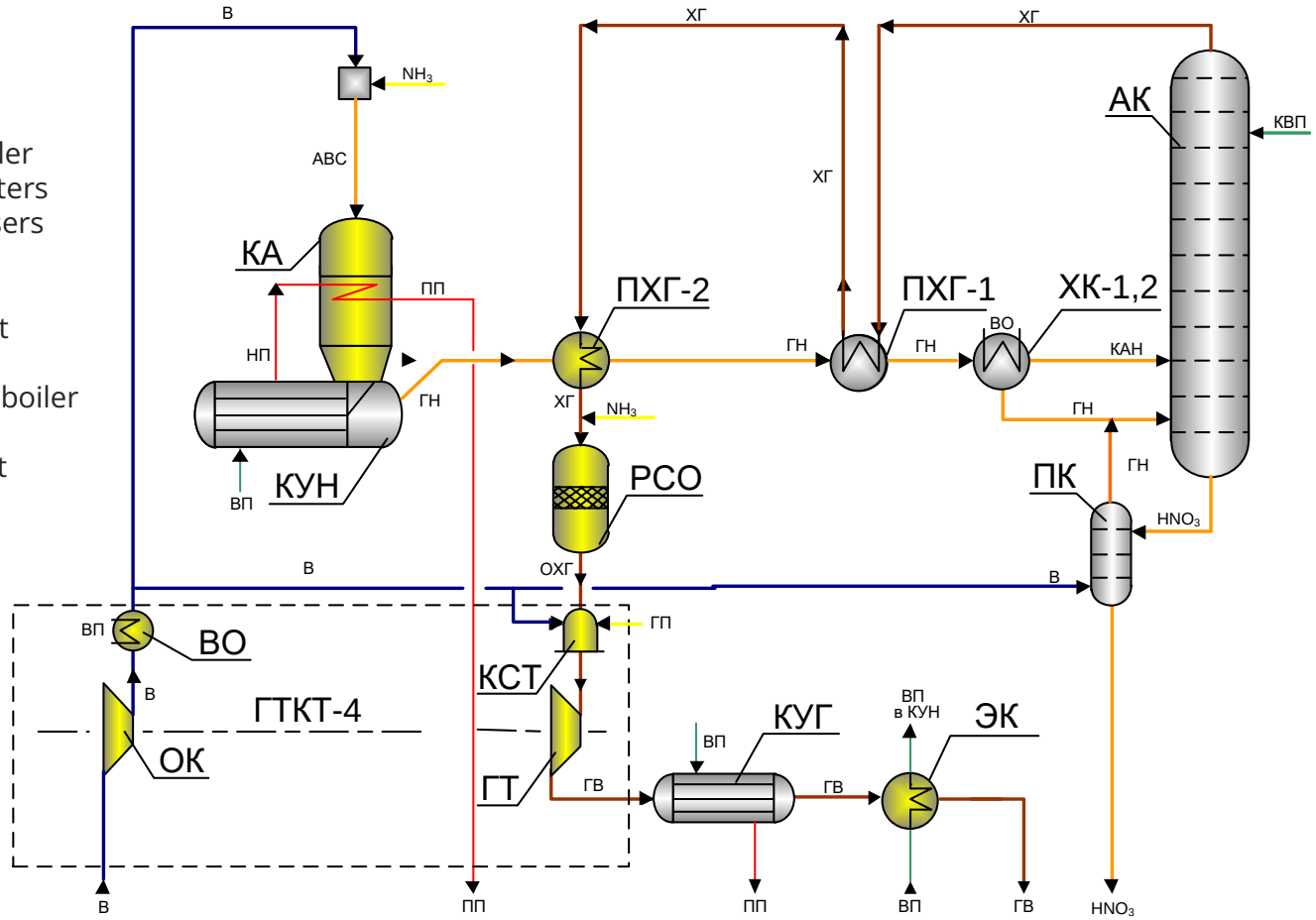
19, 20. Flushing scrubber

21. Buffer tank
22. Air blower
23. Air preheater
24. Granule cooler
25. Conveyor
26. Elevator
27. Granule sprayer

UKL-7-76M UNIT FOR THE PRODUCTION OF NON-CONCENTRATED NITRIC ACID, CAPACITY: 130 000 TPY HNO_3 MONOHYDRATE

Legend:

КА – catalytic reactor
КУН – NG waste heat boiler
ПХГ-1,2 – tail gas preheaters
ХК-1,2 – coolers-condensers
АК – absorption column
ПК – bleaching tower
РСО – selective treatment reactor
КУГ – tail gas waste heat boiler
ЭК – economizer
ГТКТ- 4 – gas-turbine unit



NEW TECHNICAL SOLUTIONS:

Catalytic reactor with increased diameter of platinoid meshes (up to 2700 mm) with shifting platinoid mesh fastening from high-temperature zone.

Highly efficient ГТКТ-4 gas turbine unit of new generation with single-pressure compressor.

Modern automated control and management system based on microprocessor technology and electronics in all modes of operation of GTKT-4 and UKL-7-76M unit.

Design combination of all-purpose combustion chamber and GTKT-4 gas turbine unit with exclusion of high-temperature lined duct.

New hardware design of exhaust gas recuperative heating stage and tail gas selective purification reactor.

BENEFITS OF WORKING WITH NIIK

NIIK IS THE ONLY COMPANY IN RUSSIA AND CIS, POSSESSING A PROPRIETARY PROCESS FOR MELAMINE PRODUCTION

ACTIVE PATENTS:

- RF 2417992 (valid until 2029)
- RF 2495875 (valid until 2032)
- RF 2495876 (valid until 2032)
- RF 2503623 (valid until 2032)
- RF 2544704 (valid until 2033)

KEY FACTORS:

- Development period of the basic engineering package - 6 months
- Single-source design in full compliance with Russian norms and standards
- Local and international procurement services
- Well-established equipment supply processes and strong relationships with supplier companies

PROPRIETARY DESIGNS

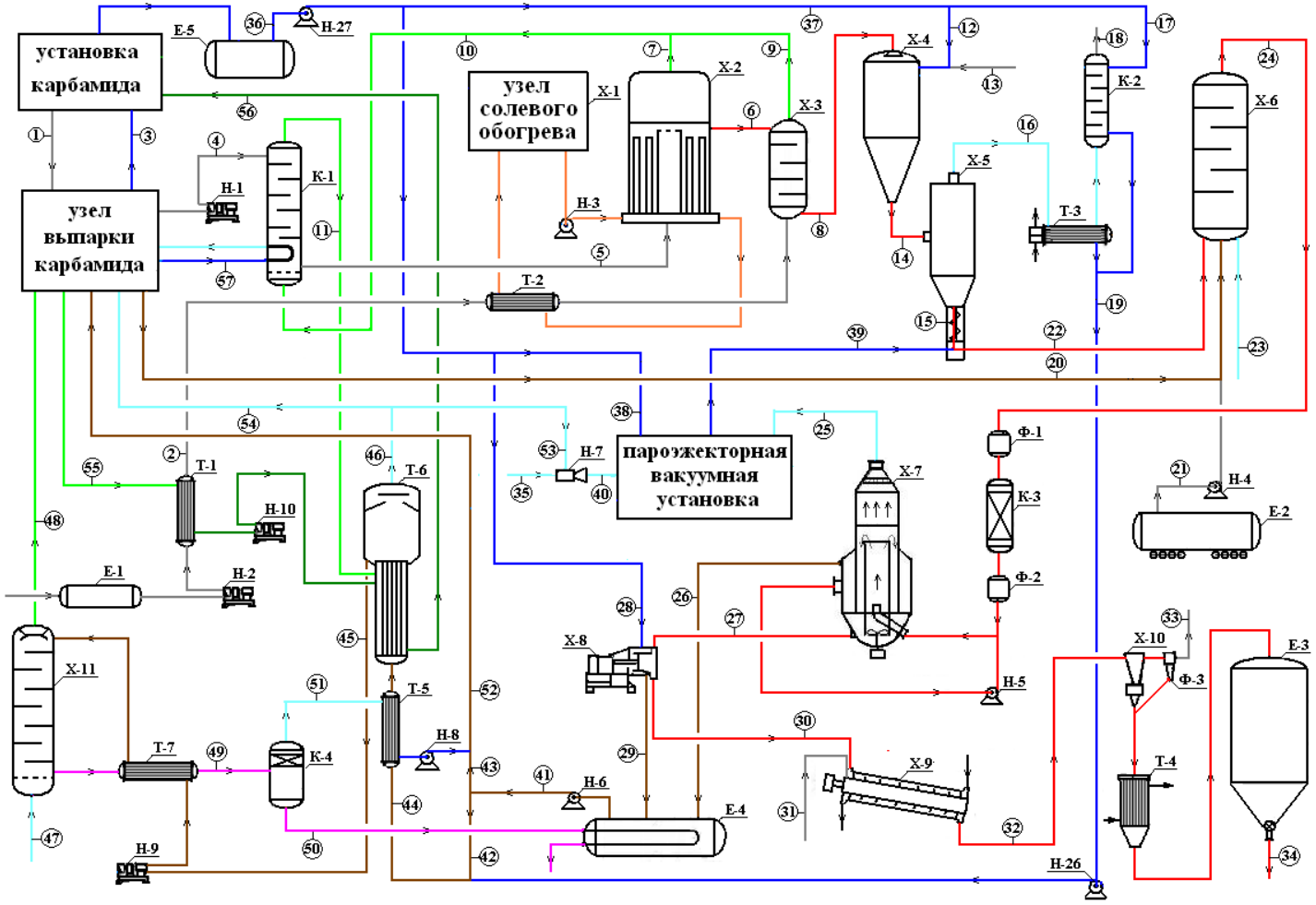
MELAMINE. CONSTRUCTION AND REVAMPS

NIIK has the necessary initial data to develop a basic engineering package of melamine production from urea under high pressure with a capacity of 40,000 tpa.

THE OFFER IS BASED ON:

- proprietary know-how package,
- accumulated during research and design activities,
- scientific support and technology improvement of existing industrial plants.

Production of melamine from urea, including recycling of production waste, is carried out according to continuous schemes; technological processes and packaging are fully mechanised, process control is carried out from the CCR.



LICENSED TECHNOLOGIES

TECHNOLOGY FOR PRODUCTION OF 32.5% UREA SOLUTION AUS 32

NIIK experience at NAK AZOT JSC, Novomoskovsk

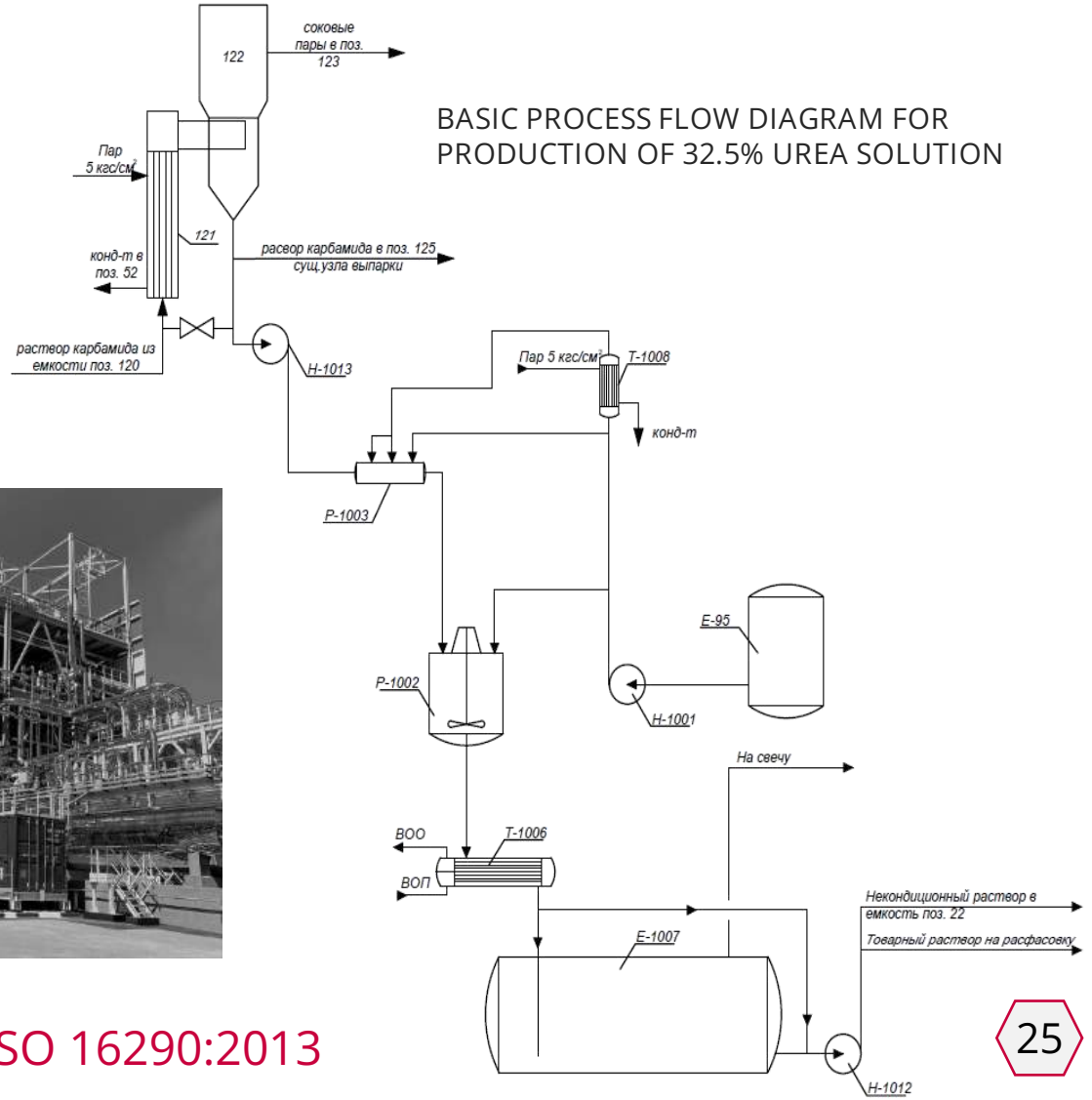
NIIK scope:

- Technological survey of urea units with reasoning of plant construction
- Project documentation
- Detail engineering
- Complete supply of process equipment including reactor, heat exchangers, tanks, pumps, pipework and shut-off and control valves, as well as instrumentation, electrical equipment and wiring materials.

NAK Azot JSC has adopted the method of producing 32.5% urea solution from urea solution with ammonia solution purification unit on the basis of evaporation unit of Urea-2 shop with the following stages:
urea solution purification unit from ammonia
urea solution dilution unit
urea solution delivery unit for packaging

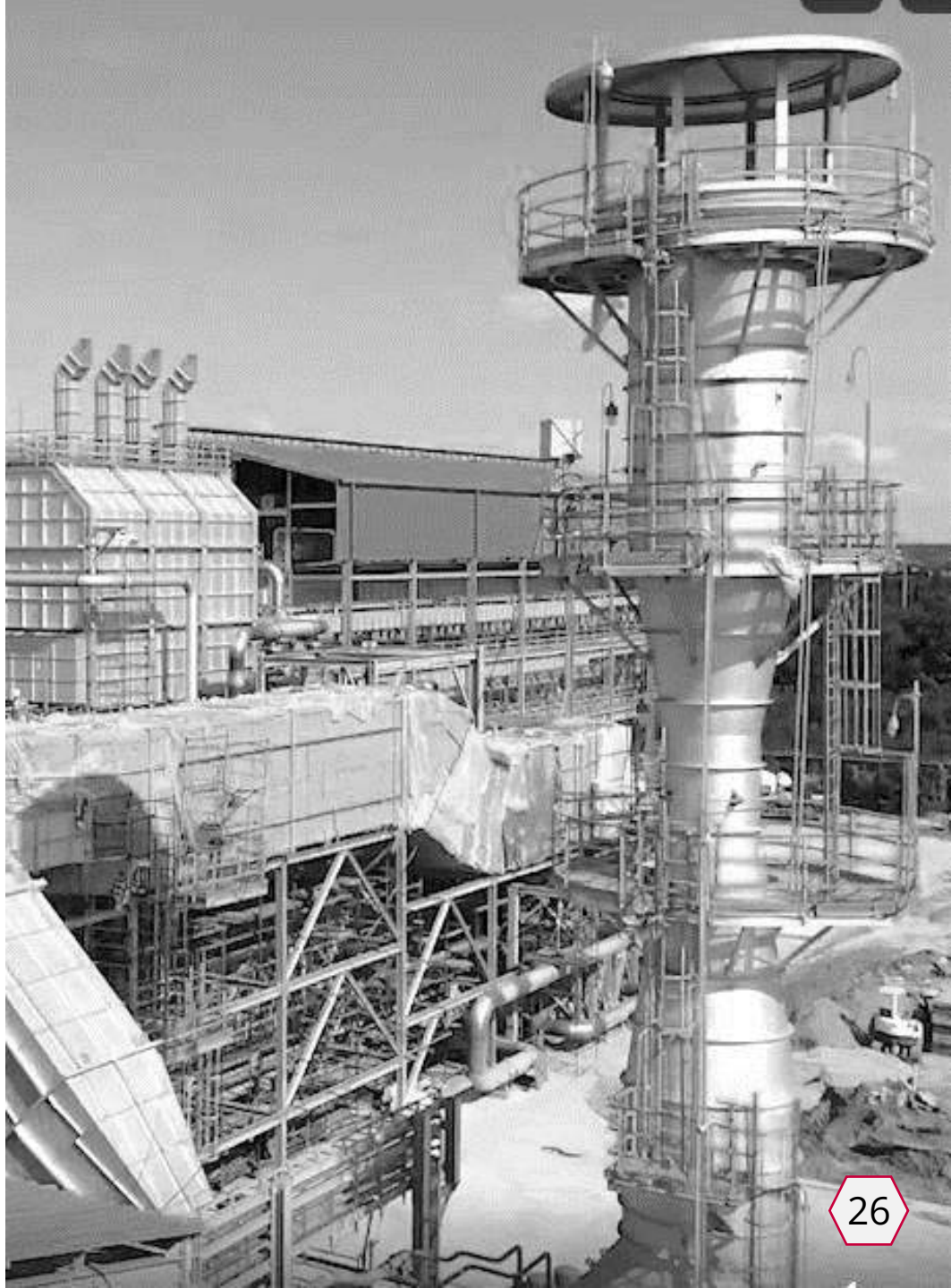
COMMISSIONING OF A 32.5 % UREA SOLUTION PRODUCTION UNIT, 2015
UNIT CAPACITY - 1 200 MTPD

BASIC PROCESS FLOW DIAGRAM FOR PRODUCTION OF 32.5% UREA SOLUTION



TECHNOLOGY READINESS LEVEL TRL 9 ACCORDING TO ISO 16290:2013

DESIGN & ENGINEERING



DESIGN & ENGINEERING

PRE-DESIGN ENGINEERING

- Feasibility study
- Declaration of intent
- Business plan
- Investment assessment

DESIGN ENGINEERING

- Authority package (Project documentation)
- Detailed design documentation
- General technical solutions
- Technical upgrade, revamping and new construction
- Adaptation of basic engineering packages to Russian norms and regulations
- Development of FEED as per licensor's requirements
- State expertises
- Development of operation documentation

SUPERVISION SERVICES

- Ensuring compliance with technical solutions
- Ensuring compliance with technical and economic indices
- Implementation of changes in the detail engineering and authority package (project documentation)

ENGINEERING DISCIPLINES

ARCHITECTURAL AND CONSTRUCTION PART

- Description of adopted space-planning solutions
- Drawings of building and structure facades
- Building and structure floor plans
- Structural calculations
- Drawings of building and structure sections
- Diagrams of civil structure frames and connections
- Floor, covering and roofing plans
- Enclosing structure and partition layouts
- Foundation plan and sections

PROCESS SOLUTIONS

- Process flow diagrams
- Equipment and premise layout
- Installation drawings
- Pipelines installation list
- Fastening details
- Equipment specifications
- Data sheets
- Calculations based on licensed software
- Categorization (classification) acts
- Layouts of energy metering devices
- Process procedure
- Process Hazard Analysis
- Fire safety
- Industrial safety
- Civil Defense and Emergency Situations
- Industrial Safety Declaration
- Labor conditions and organization

PLOT PLAN

- Land plot layout diagram
- Earth mass plan
- Master plan of utility services
- Key plan of capital construction facility location within land plot boundaries

End-to-end multidisciplinary information modelling (IM) is used

ENGINEERING DISCIPLINES

HEATING

- Heating and ventilation equipment specifications
- Table of air-heat balances
- Thermotechnical calculations
- Specification
- Control unit flow diagram
- Plans
- Axonometric diagrams
- Ventilation flow diagrams
- Refrigeration flow diagrams

ELECTRICITY

- Power supply structure diagram
- Electrical distribution network block diagrams
- Layouts of equipment and cable routes
- Cable and pipe log
- Specification of equipment and materials
- Electric control flow diagrams
- Electrical diagrams of external connections
- Data sheets (if necessary)
- Signal exchange structure diagram (if necessary)
- Calculations (load calculations, short-circuit current calculations, relay protection setting calculations, grounding and lightning protection calculations, lighting calculations, etc.)

WATER SUPPLY AND WATER DISPOSAL

- Gas metering units
- Gas pipeline route diagram
- Legend
- Gas pipeline plan
- Planned volumes of natural gas consumption
- Building and structure list

End-to-end multidisciplinary information modelling (IM) is used

ENGINEERING DISCIPLINES

HEATING, VENTILATION AND AIR CONDITIONING

- Heating and ventilation equipment specifications
- Table of air-heat balances
- Thermotechnical calculations
- Specification
- Control unit flow diagram
- Plans
- Axonometric diagrams
- Ventilation flow diagrams
- Refrigeration flow diagrams

AUTOMATED CONTROL SYSTEMS

- Refrigeration system automation
- Cooling water cycle automation
- Automation of thermomechanical solutions
- Networks and Communications
- Automatic Fire Alarm System
- Fire Fighting Automation
- Projects of Technical Security Equipment Set (KITSO)

ECOLOGY

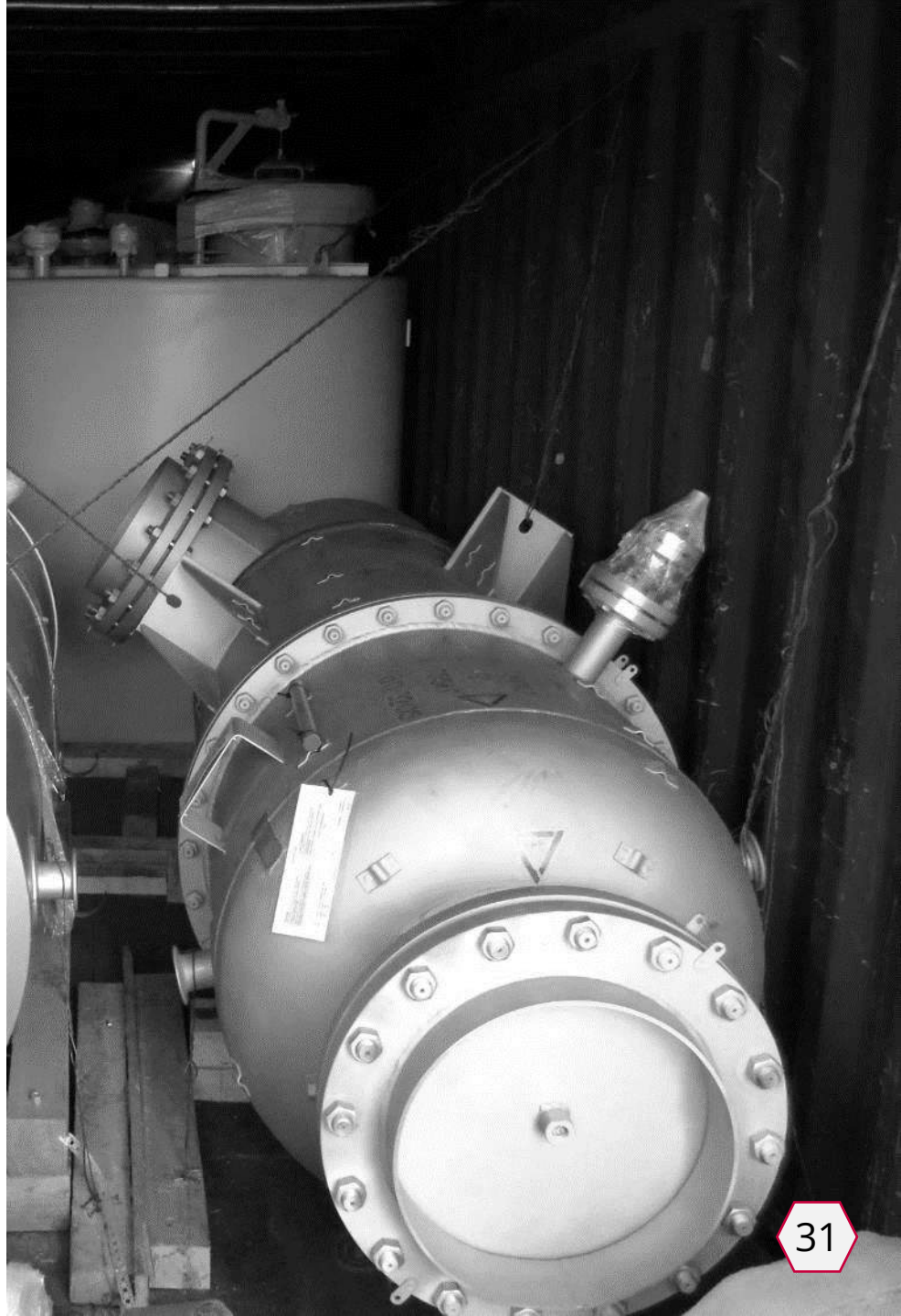
- Materials of environmental impact assessment of the planned economic activity
- List of environmental protection measures
- Carrying out public discussions of environmental impact assessment materials in accordance with the Order of the Ministry of Natural Resources
- Carrying out State ecological expertize procedure of authority package (project documentation)

WATER SUPPLY AND WATER DISPOSAL

- Flow diagrams
- Water supply network plan
- Axonometric diagrams
- Process diagrams
- Installation drawings
- Equipment layout. Plans at elevations
- Equipment specifications
- Data sheets
- Network profiles, manhole tables

End-to-end multidisciplinary information modelling (IM) is used

DESIGN AND PROCUREMENT OF EQUIPMENT



DESIGN AND COMPLETE DELIVERY OF EQUIPMENT

- EQUIPMENT DESIGN
- PLACING ORDERS AND CONTROLLING THE PRODUCTION OF EQUIPMENT
- PROCUREMENT OF PIPELINES, FITTINGS AND INSTRUMENTATION
- EQUIPMENT SUPPLY AND PARTICIPATION IN COMMISSIONING

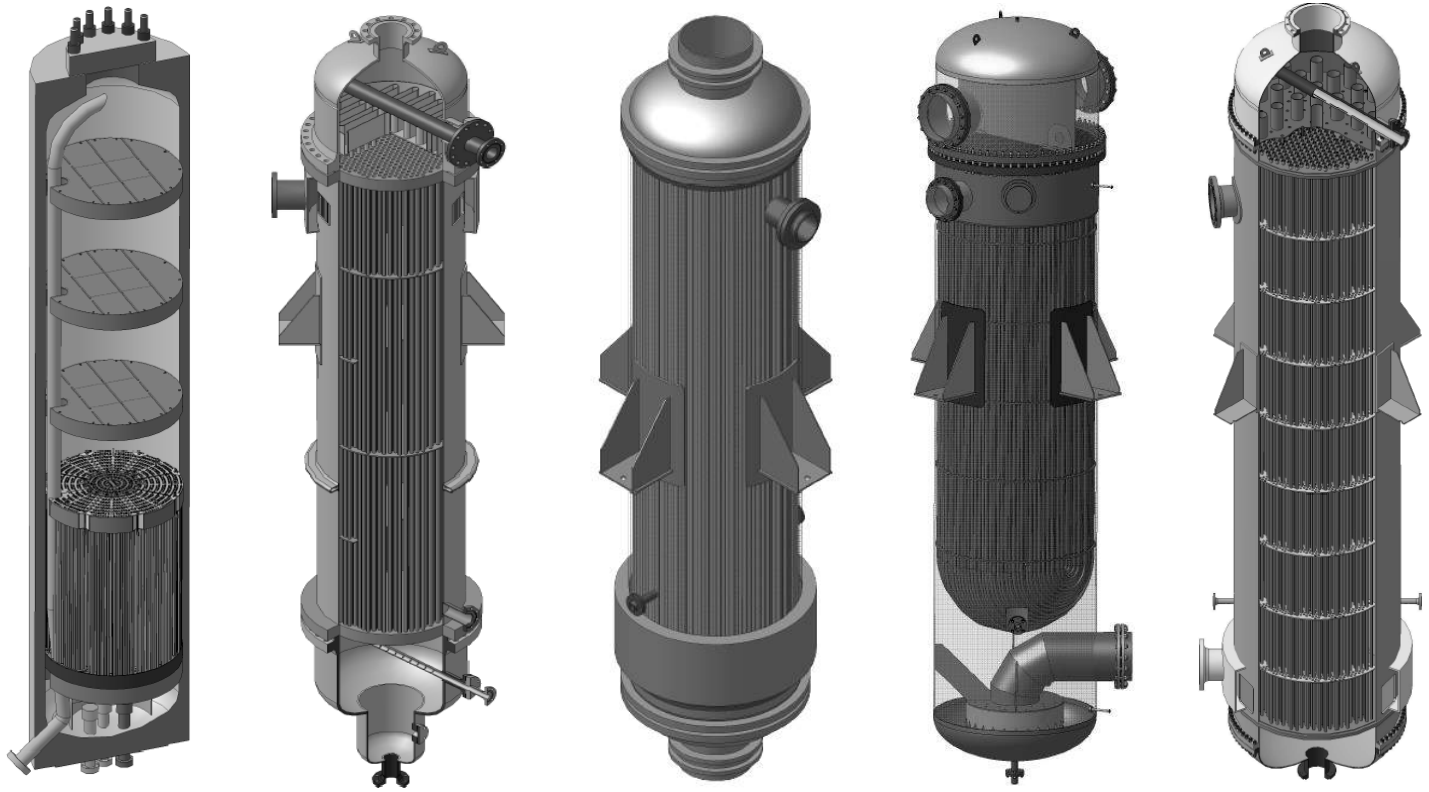
OUR ADVANTAGE

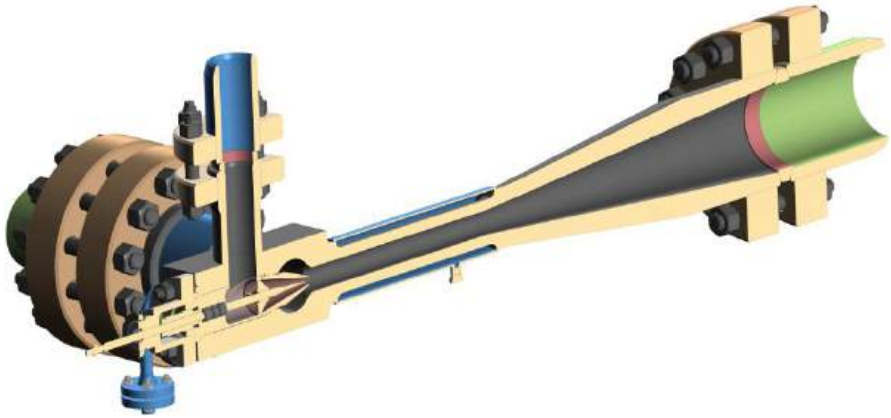
- The main criteria for selecting suppliers are quality, cost, reliability
- Long-term experience of co-operation with leading metallurgical and machinery enterprises in Russia, Europe and Asia

DESIGN & ENGINEERING

THE BASIS OF DESIGN ENGINEERING EFFICIENCY - INFORMATION MODELLING. DEVELOPMENT OF CHEMICAL EQUIPMENT

NIIK is developing all types of chemical static equipment. The main HP equipment of urea plant. Previously the equipment was developed and manufactured in EU, Japan, Korea.



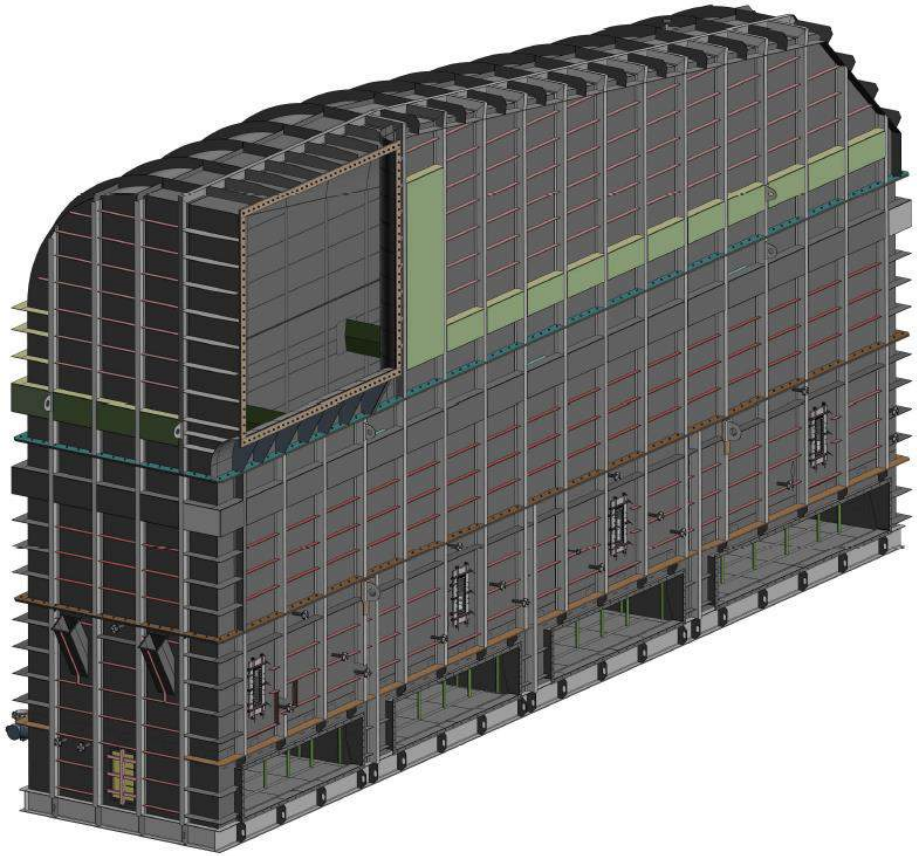


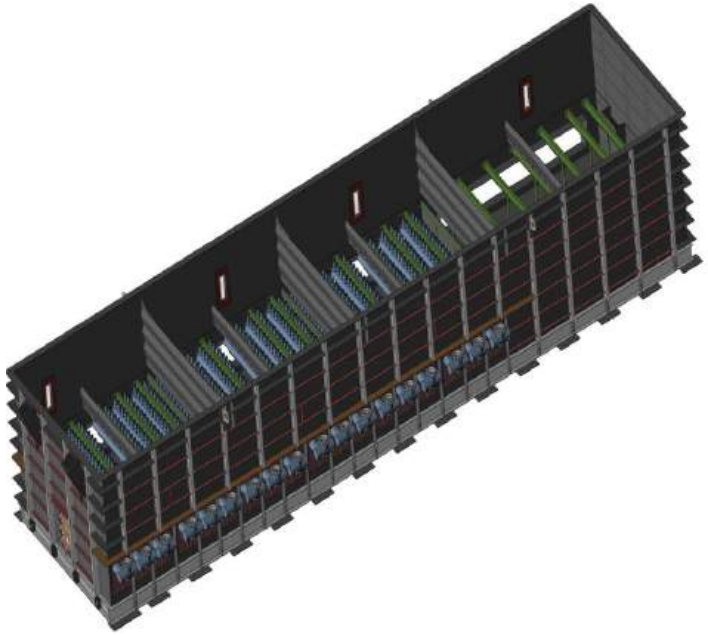
High-pressure ejector for technical modernization of urea plant.
Previously developed and supplied only by the German company Korting Hannover AG.

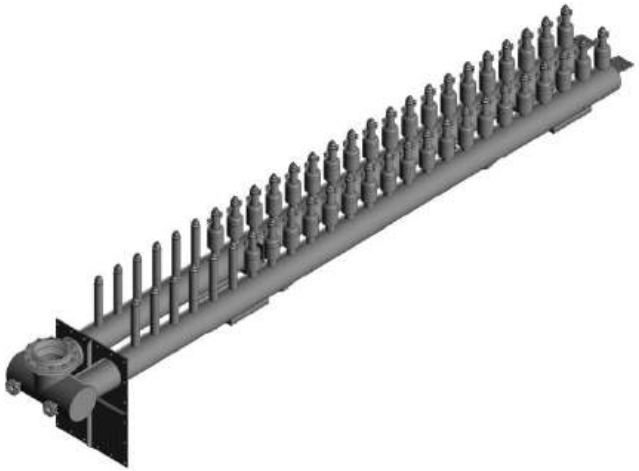
DESIGN & ENGINEERING

THE BASIS OF DESIGN ENGINEERING EFFICIENCY - INFORMATION MODELLING. DEVELOPMENT OF CHEMICAL EQUIPMENT

NIIK is developing urea plant granulators with capacities of 2000 – 4200 mtpd. Previously these were developed and supplied only by European and Japanese companies



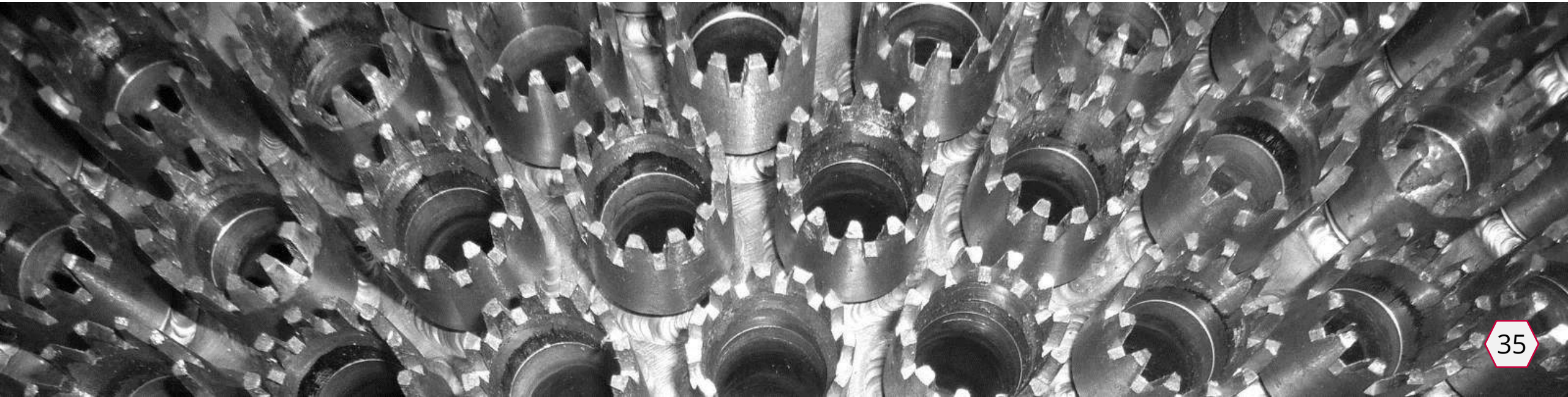




SELECTION AND CONTROL OF MATERIALS USED

- Initial data on construction materials for design of equipment and pipelines
- Intergranular corrosion tests
- Study of corrosion resistance of materials and their welded joints in urea production conditions
- Metallographic testings

All procured steel products undergo additional in-house inspection in the welding and corrosion laboratory. The test results are attached to the quality certificate



COMPLETE DELIVERY

NIIK OFFERS A WIDE RANGE OF TURNKEY DELIVERIES FOR THE IMPLEMENTATION OF EPS PROJECTS

- Static and dynamic equipment
- Pipeline valves
- Pipeline components
- Instrumentation and controls and fire alarm equipment
- Rolled steel
- Electrical equipment and wiring materials
- Cable products

ADVANTAGES FOR THE CUSTOMER:

1. Opportunity to reduce time by placing orders simultaneously with the engineering process
2. Single source responsibility for the project and delivery and minimization of price risks
3. Prompt adjustment of the procurement items in accordance with the changes being made

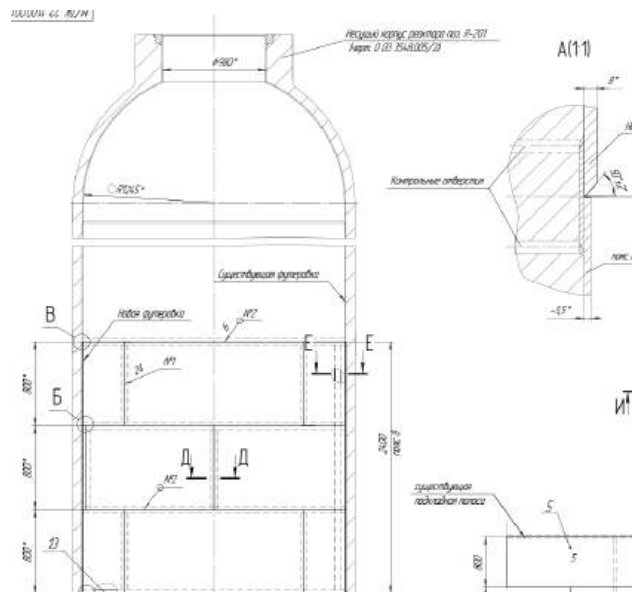
EQUIPMENT AFTERSALES SERVICES

CORE COMPETENCES

NIIK specialists have mastered all main methods and equipment for corrosion surveys and diagnostics. Unique NIIK technologies for repair of process equipment are also developed here.

INSPECTION

visual and measuring testing, wall thickness measurement, ultrasonic testing, dye penetrant testing, eddy current testing



ENGINEERING

development of equipment design and process documentation, site and technical supervision

INSTALLATION

preparation, assembly-welding works, quality control of installation works

EQUIPMENT AFTERSALES SERVICES

DIAGNOSTICS OF EQUIPMENT

1 On-site inspections

2 Data Study

3 Reports and recommendations

NON-DESTRUCTIVE TESTING METHODS

- Visual checkup (VIC)
- Ultrasonic thickness testing and non-destructive testing (UT & NDT)
- Eddy current thickness measurement and flaw detection of pipes of heat exchange equipment
- Liquid penetrant inspection (LPI)
- Metallographic testing
- Intergranular corrosion tests
- Steel analysis

EQUIPMENT AFTERSALES SERVICES

EQUIPMENT REPAIR

- Local repair and replacement of corrosion-resistant liners of any forms and dimensions
- Restoration and repairs of HP vessel shells
- Replacement of cover sealings of HP vessels
- Replacement of nozzles of HP vessels
- Replacement of bottoms and other vessel elements
- Replacement of heat exchange tubes without deinstallation of the vessel
- Installation of internal devices
- Turnkey repair works

DIAGNOSTICS AND REPAIRS OF EQUIPMENT

REFERENCES

CORROSION INSPECTION

> 1000

UREA UNIT ITEMS

REPAIRED

> 200

EQUIPMENT ITEMS IN RUSSIA AND ABROAD

LINER REPLACEMENT

> 45

UREA SYNTHESIS CONVERTERS

DIAGNOSTICS BY EDDY CURRENT TESTING

> 1500

EQUIPMENT ITEMS

TURNKEY REPAIR

> 25

UREA UNIT ITEMS

EXPERIENCE IN TECHNICAL INSPECTIONS FOR FOREIGN PLANTS

Nitrogénmüvek Zrt
Hungary, Petfurdo
Inspection of corrosion and technical condition of high pressure equipment in urea workshop
2015

SORFERT UREA UNIT
Algeria, Oran
Corrosion inspection of urea plant
2021

Misr Fertilizer Production Company (MOPCO)
Egypt, Damietta
Corrosion inspection of two urea plants
2019

Egyptian Fertilizers Company (EFC)
Egypt, Attaka
Corrosion inspection of urea plants
2015

Middle East
Technical inspection of urea plant
2012

Navoiyazot JSC
Uzbekistan, Navoiy
Eddy current monitoring of nitric acid production equipment
2004

Farg'onaazot JSC
Uzbekistan, Fergana
Inspections: urea
ammonium nitrate
nitric acid
1990-2014
2014
2014

MAXAM-CHIRCHIQ JSC
Uzbekistan, Chirchiq
Comprehensive inspection of urea workshop
Urea inspections
2004
2016

TESTING FACILITY

ГЛАВНОЕ НАПРАВЛЕНИЕ - АНАЛИТИКА

NIIK OFFERS ITS SERVICES IN TESTING PRODUCTS FOR COMPLIANCE WITH REGULATORY DOCUMENTATION (GOST, TU):

- Urea and its derivatives (aqueous urea solutions)
- Mineral fertilizers
- Chemical products
- Formaldehyde resins
- Antifreezing agents, cooling fluids
- Polyolefin and polyvinylchloride films
- Polymer packaging
- Cleaning agents, other chemicals (technical detergents)

TESTING FACILITY OFFERS ITS CUSTOMERS:

- Methodological support for urea plant (a collection of certified measurement methods included in the federal register of measurement methods) in accordance with GOST R 8.563-2009 measurement methods (techniques)
- Methodological and technical assistance in the introduction of new analytical methods for production control
- Turnkey design and supply of analytical laboratories
- Supply of necessary equipment and instruments, commissioning and training of employees
- Development and validation of quantitative chemical analysis methods

GEOGRAPHY OF OPERATIONS

REFERENCE LIST. RECENT PROJECTS

Nondisclosed
(Russia)

Urea Plant (2023 – ongoing)

Construction of 3 100 mtpd urea distillation synthesis unit

- Main technical solutions
- Project documentation
- Reference design
- Licence for a set of internal devices
- Detail Engineering
- Technical support of equipment procurement and manufacturing

Farg'onaazot JSC
(Fergana, Uzbekistan)

Urea Plant (2024 – ongoing)

Urea plant revamp and capacity increase to 1,500 mtpd with possible integration of a melamine unit into the facility

- Basic Engineering

REFERENCE LIST. RECENT PROJECTS

Acron PJSC
(Velikiy Novgorod, Russia)

Urea Plant (2018 – 2021)

- Urea plant №6 construction with capacity 600 mtpd (commissioned in 2019)
- Urea granulation unit with capacity 2 000 mtpd
- Urea unit № 6 modernization aimed at capacity increase to 2 050 mtpd (commissioned in 2021)

Licensor: Urea unit 6, 6+ : NIIK

Unit No 6 (600 mtpd)
- Authority Package and Detail Engineering
- Critical equipment procurement (EP scope)

Unit No 6+ (2 050 mtpd)
- Authority Package and Detail Engineering
- Critical equipment procurement (EP scope)

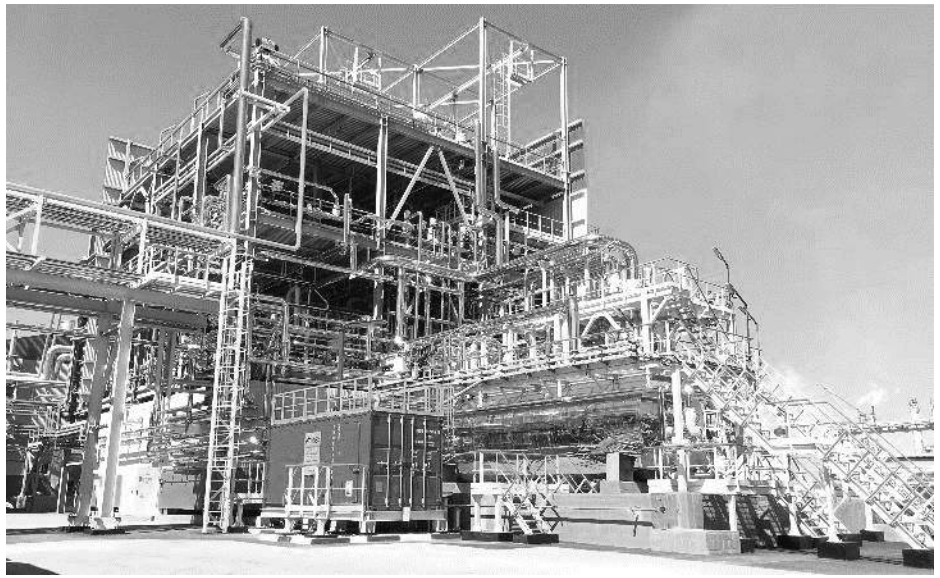
Granulation unit (2 000 mtpd)
- Adaptation of Licensor's basic engineering package
- Authority Package and Detail Engineering

NAK Azot JSC
(Novomoskovsk, Tula region, Russia)

UAN Plant (2020 – 2021)

Capacity: 1 200 mtpd
Licensor: NIIK
General contractor: NIIK

- Technical solutions
- Authority Package
- Detail Engineering
- Equipment procurement



REFERENCE LIST. RECENT PROJECTS

ShchekinoAzot JSC
(Tula region, Russia)

M-500 methanol plant (2017 – 2021)

Capacity: 1 500 mtpd (500 000 tpy)
Licensor: Haldor Topsoe

- Adaptation of Licensor's basic engineering package of methanol production to Russian norms and regulations
- Authority Package
- Detail Engineering
- Field Supervision and Construction Supervision

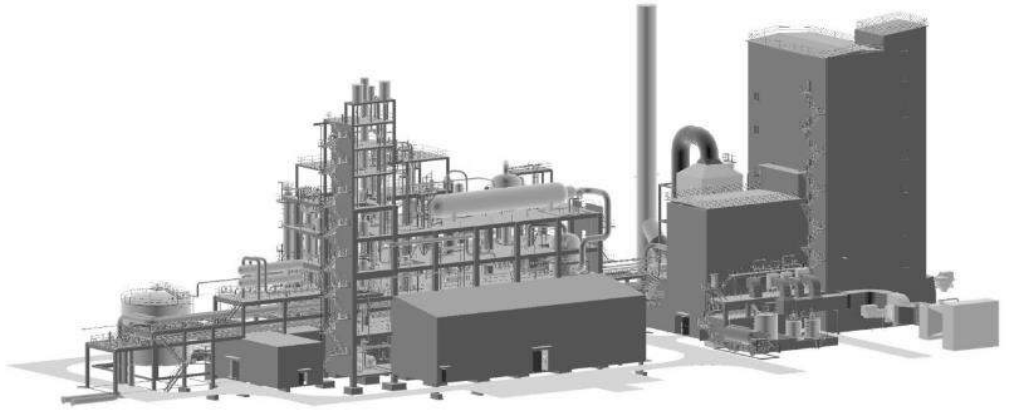
ShchekinoAzot JSC
(Tula region, Russia)

Urea and ammonia plant (2019 – ongoing)

Capacity:
Ammonia – 525 000 tpy
Urea – 700 000 tpy

Licensor:
Ammonia – Haldor Topsoe
Urea – Stamicarbon
General contractor:
China National Chemical Engineering Co. Ltd. (CNCEC)

- Front end engineering design, pre-environmental impact assessment
- Adaptation of Licensor's basic engineering package
- Authority Package
- State expertize coordination
- Adaptation of Detail Engineering



REFERENCE LIST. RECENT PROJECTS

Apatit JSC
(Cherepovets, Russia)

Non-Concentrated Nitric Acid Plant UKL-7-76M (2017 – 2020)

Capacity: 135 000 tpy (monohydrate)
Licensor: NIIK
General contractor: NIIK

- Authority Package
- Detail Engineering
- Equipment procurement
- Start-up & commissioning
- Construction design supervision
- Operational and maintenance documentation

Metafrax PJSC
(Gubakha, Russia)

Ammonia - Urea – Melamine Plant (2016 – 2022)

Capacity:
Ammonia – 900 mtpd
Urea – 1 750 mtpd
Melamine – 120 mtpd

Licensor:
Casale SA
General contractor (OSBL):
NIIK
Licensor of prilling technologies:
NIIK

- Authority Package
- Detail Engineering
- Equipment procurement
- Start-up & commissioning
- Construction design supervision

REFERENCE LIST. RECENT PROJECTS

PhosAgro-Cherepovets JSC
(Cherepovets, Russia)

Urea plant (2012, 2017)

Capacity: 1 500 mtpd (each unit)
Licensor: Stamicarbon

- Authority Package
- Detail Engineering
- Construction design supervision
- Equipment procurement for prilling tower

PhosAgro-Cherepovets JSC
(Cherepovets, Russia)

Ammonia Plant (2017)

Capacity: 2 200 mtpd
Licensor: Haldor Topsoe

- Adaptation of Licensor's basic engineering package to Russian norms and regulations
- Authority Package
- Detail Engineering of civil part
- Construction design supervision
- Design of analytical laboratory (ammonia production plant)
- Turn-key project for construction of an analytical laboratory

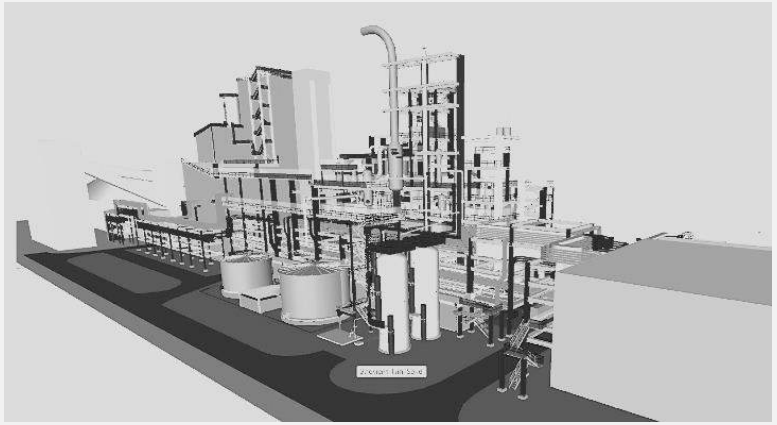
REFERENCE LIST. RECENT PROJECTS

Volgafert LLC
(JV KuybushevAzot PJSC and Maire Tecnimont Group, Togliatti)

Urea Plant (2017)

Capacity: 1 500 mtpd (granulated)
Licensor: Stamicarbon
EPC-contractor: Maire Tecnimont Group

- Adaptation of Licensor's documentation on ISBL facilities to Russian norms and regulations
- Basic Engineering for urea production OSBL facilities
- Authority Package
- Adaptation of Detail Engineering to Russian norms and regulations
- Detail Engineering (civil, electrical, HVAC sections)



Nizhnekamskneftekhim PJSC
(Nizhnekamsk, Russia)

Methanol Plant (2019 – 2020)

Capacity: 1 500 mtpd
Licensor: Haldor Topsoe

- Adaptation of Licensor's basic engineering package of methanol production to Russian norms and regulations
- Authority Package

REFERENCE LIST. RECENT PROJECTS

Togliattiazot PJSC
(Togliatti, Russia)

Urea Plant and new prilling tower (2015 – 2022)

Capacity: 2 200 mtpd
Licensor: Casale SA

- Adaptation of Licensor's basic engineering package of urea production to Russian norms and regulations
- Authority Package, equipment procurement for prilling tower and handling system
- Detail Engineering (civil documentation)
- Field supervision

KuybushevAzot JSC
(Togliatti, Russia)

Ammonia Plant (2014 – 2017)

Capacity: Ammonia – 1 340 mtpd, Hydrogen – 8000 nm^3/h
Licensor: Linde

- Adaptation of Licensor's basic engineering package to Russian norms and regulations
- Authority Package
- Detail Engineering
- Field supervision

KEY RECENT OVERSEAS PROJECTS

Inspections and repairs of HP vessels:

Nitrogénművek Zrt, Hungary

EFC, Egypt

MOPCO, Egypt

Alexfert, Egypt

Sorfert, Algeria

Helwan Fertilizer Co., Egypt

Plants for complex fertilizers production:

PetroVietnam Fertilizers and Chemicals Corp., Vietnam

QAFCO, Qatar

Modernization of urea plants:

GNFC, India

RCF Thal, India

Yara Fertilizer, India

Chambal Fertilizers, India

RCF Trombay, India

YOUR PLANS – OUR TECHNOLOGIES

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FROM TECHNOLOGICAL SOVEREIGNTY
TO TECHNOLOGICAL LEADERSHIP