KRYLOV SHIPBUILDING RESEARCH INSTITUTE

RESEARCH AND DESIGN OF VESSELS, STRUSTURES AND EQUIPMENT FOR RUSSIAN OIL AND GAS OFFSHORE PROJECTS

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Head of Division, Dr. Science, Professor

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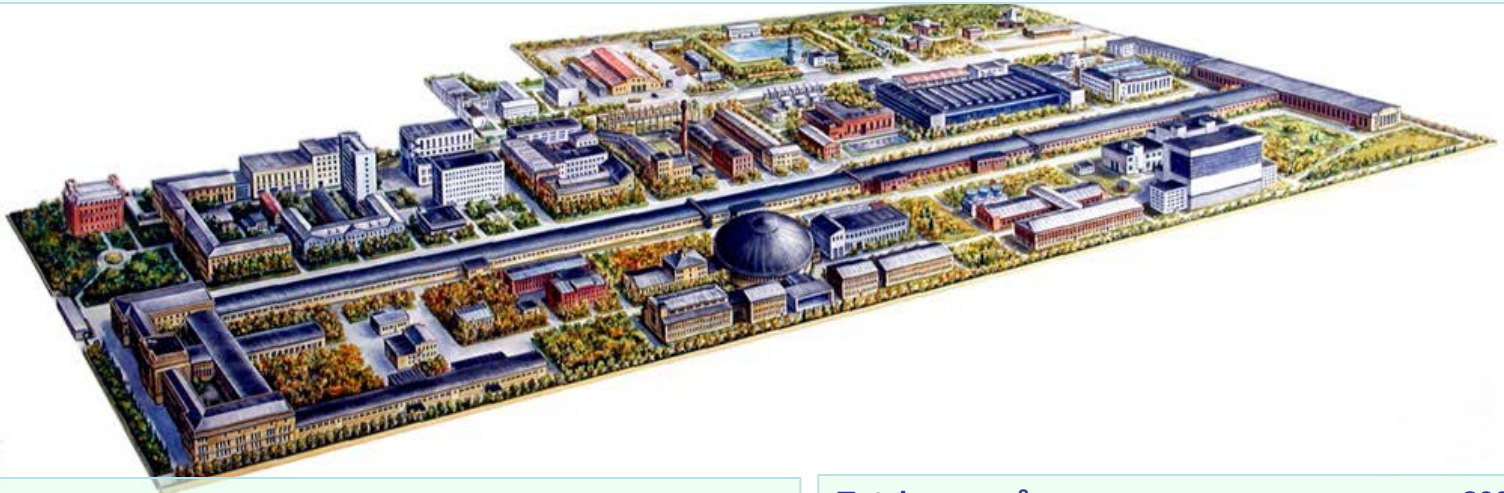
RESEARCH AND DESIGN CAPABILITIES OF THE INSTITUTE

KRYLOV SHIPBUILDING RESEARCH INSTITUTE

The Institute was established in 1894

Recognized world research center, providing:

- Development of regulatory-methodological basis for design and construction of ships and marine technology
- Pioneering design of vessels and offshore structures
- Determination of strategic directions for the development of shipbuilding industry



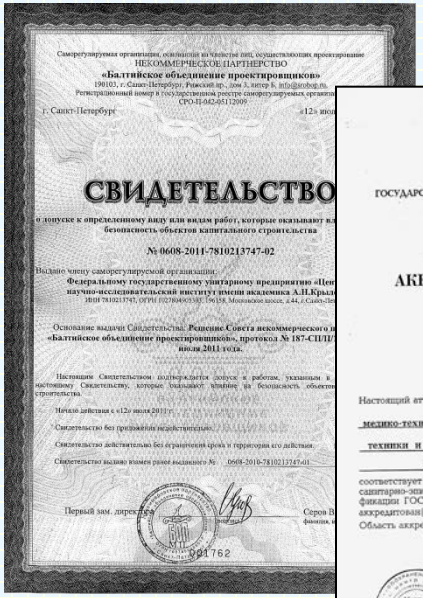
Over the years of activities:

- More than *12 thousand models* of naval ships, vessels, ocean engineering means and other units *were tested*
- The *geometric parameters of more 10 thousand propellers* ensuring max efficiency of engines were determined
- The *strength and vibration tests of about 20 thousand* semi-full scale and full scale hull structures were performed
- The technical and operational-economic *expertise of more than about 2 thousand projects* developed by the design bureaus of the USSR and the Russian Federation was carried ou
- More than *2600 ships and vessels* with a total displacement of about 12 mln. tons were *built* to the *designs* of the Institute's branch Central Design Bureau (CDB) "Baltsudoproject"

Total area, m^2	800 000
Number of buildings, units	100
8 model basins filled with ¼ million m^3 of water	
Personnel strength, persons	~2500
including:	
- Full Members of the Russian Academy of Sciences and Industry Academies of Sciences	30
- Professors	60
- Doctors of Science	300
- Laureates of various Prizes	120
- Honored Workers of Science and Technology of Russia in various nominations	50

LICENCES AND CERTIFICATES FOR DEVELOPMENT ACTIVITY

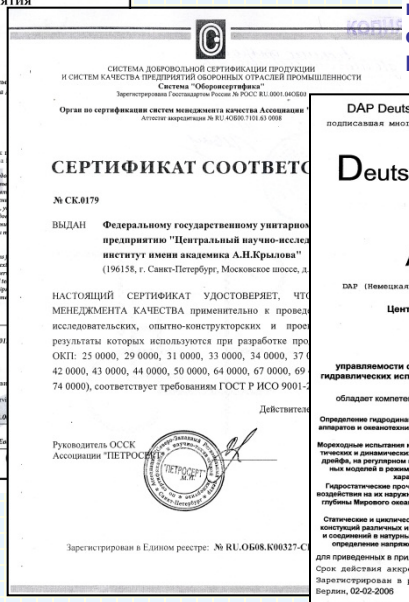
Four laboratories of the Institute since July 2001 are accredited by the DAP (DEUTSCHES AKKREDITIERUNGSSYSTEM PRUFWESSEN GMBH) for conformity with the international standard DIN EN ISO/IEC 17025:2000-04 “General requirements for the competence of testing and calibration laboratories”



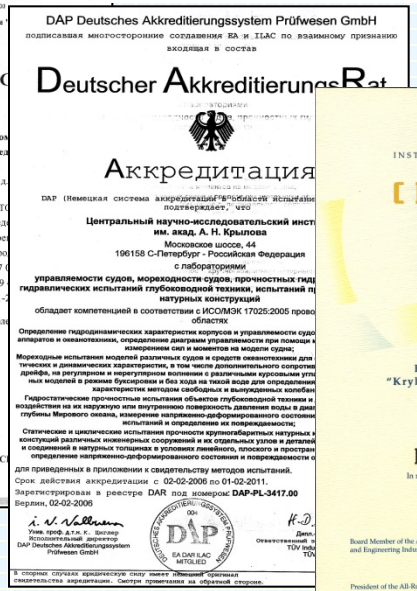
The competency certificate for works on preparing of the design documentation, issued by noncommercial partnership «Baltic association of designers»

The certificate of accreditation from State Sanitary Epidemiological Service (Gossanepidemsluzhba of Russia)

The certificate from the Russian Maritime Register of Shipping for the design of floating technical facilities



ISO 9001-2001 Certificate of Conformity № СК.0179 and № СК.0166



DAP German Accreditation System Certificate

European Standard

PARTICIPATION IN ACTIVITIES OF INTERNATIONAL ORGANIZATIONS

During many years the specialists of the Institute are actively participating in the activities of:

ITTC International Towing Tank Conference
- Propulsion Committee
- Waterjet Committee
- Thruster Committee
- Committee on High-Speed Craft
- Advisory Committee

ISSC
- Technical Committee III.2 (Fatigue and fracture)
- Technical Committee I.2 (LOADS)

i-ince International Institute of Noise Control Engineering
- Committee TK43 “Acoustics”
- in Committee TK108 “Vibration and Noise”

IACS INTERNATIONAL ASSOCIATION OF CLASSIFICATION SOCIETIES LTD.
- preparation of IACS Unified Requirements for Bulkers and Tankers

International Maritime Organization
- Maritime Safety Committee

ISO International Organization for Standardization
- Ships and Marine Technology Committee

The researchers of the Institute are actively participating in international seminars, conferences and workshops in different countries of the world in such areas as hydrodynamics, strength, acoustics and shelf development, among which MAST and INTERNOISE can be named.

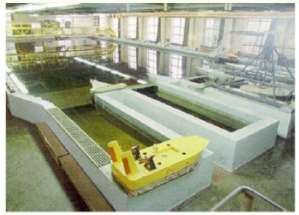
The Institute is a co-organizer of some international scientific and technical conferences held in Russia

- ISC – International Shipbuilding Conference
- RAO – Russian Arctic Offshore
- NEVA – Shipbuilding, Shipping, Ports Activities and Ocean and Shelf Development
- TRANSNOISE – Transport Noise and Vibration
- ICETECH – Polar Technologies
- POLARTECH – Development and Commercial Utilization of Technologies in Polar Regions

SCIENTIFIC AND TECHNICAL CAPABILITIES OF THE INSTITUTE

Deep-water towing tank

Rotating-arm basin

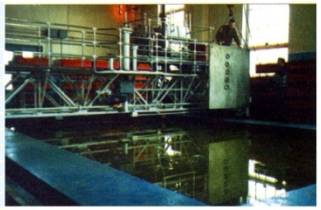


Seakeeping-Maneuvering basin

Shallow-water basin

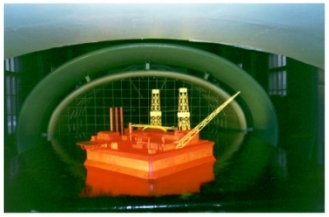
Seakeeping basin

Ice test tank



Hydroacoustic basin

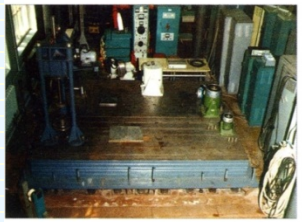
Complex of cavitation tunnels



Wind tunnel

Hall for life-cycling static tests

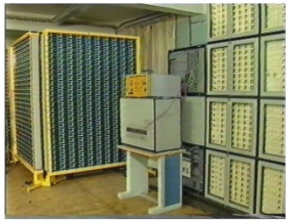
Chambers for hydraulic and hydrostatic tests



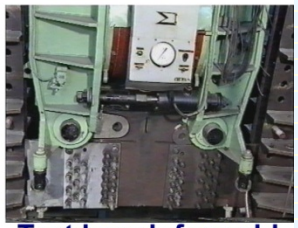
Vibration and acoustics test benches

Cavitation basin

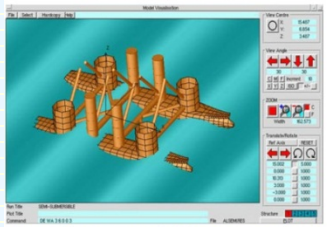
Stratified basin for study of non-uniform fields

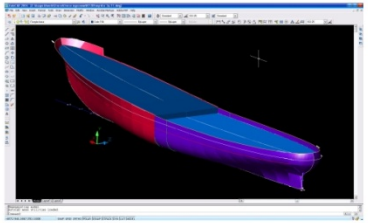


Test bench for physical fields modeling



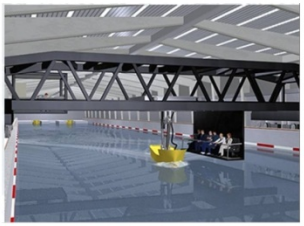
Test bench for cold resistance tests of materials





Design and Research Center of Ocean Engineering and Central Design Bureau “Baltsudoproject”

Noise source identification test bench



Future universal offshore basin

Future ice test tank

PRIORETY SPHERES OF THE INSTITUTE'S ACTIVITIES

- **Basic and applied, theoretical and experimental research towards the development of marine technology including:**
  - **- hydrodynamics**
  - **- strength and vibration**
  - **- acoustics**
  - **- electrodynamics and electromagnetic compatibility**
  - **- nuclear and radiation safety**
- **Conceptual developments in naval engineering, expert analysis of designs**
- **Design solutions and engineering of marine technology for offshore oil and gas production**
- **Development of civil marine technology projects**
- **Development of propulsion system projects (propellers, water jets etc.)**
- **Development and delivery of means of acoustic and electromagnetic protection**
- **Development and delivery of instrumentation for monitoring and diagnostics of marine technology objects**

RANGE OF INSTITUTE'S SERVICES

- **Design of ships and ocean technology starting from conceptual design through to detailed and engineering design documentation**
- **Preparation of standards and engineering specifications for design and engineering of naval and merchant ships and other marine technology, expertise of ship and offshore structure designs**
- **Development of long-term programs and plans for shipbuilding development**
- **Analysis of trends in development of modern marine technology and market situation**
- **Model tests and full-scale trials of all types of naval and merchant ships and other marine technology**
- **Research and development of recommendations on hull strength and structural design, reduction of noise and vibration, anticorrosive protection, diagnostics of condition of structures and machinery, environmental situation monitoring**

THEORETICAL, NUMERICAL AND EXPERIMENTAL STUDIES

EXPERIMENTAL-ANALYTICAL STUDIES OF PLATFORMS UNDER ICE CONDITIONS AND IN WAVES

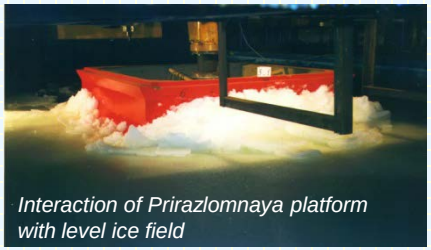

Washing down the buoy under 100-year storm conditions

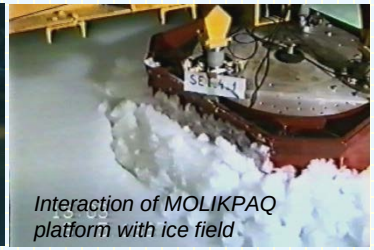

Octabuoy has lower motions than SPAR

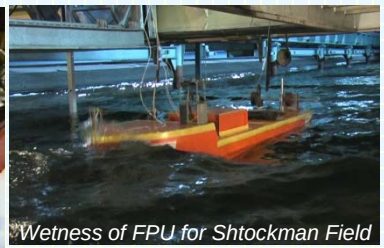

SPAR motions under 100-year storm

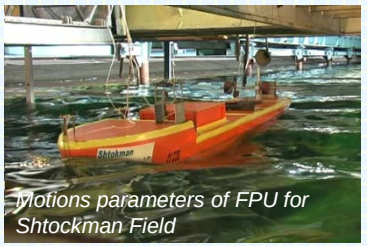

Wetness of Prirazlomnaya platform


Shallow water tests


Interaction of Prirazlomnaya platform with level ice field


Interaction of MOLIKPAQ platform with ice field


Wetness of FPU for Shtockman Field


Motions parameters of FPU for Shtockman Field


Model of SSFDR during seakeeping tests (Irregular seas)

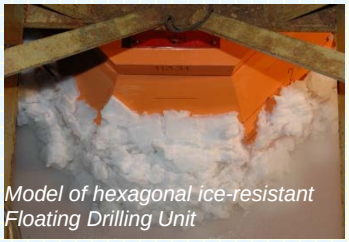

Interaction of SPAR model with level ice


Interaction of SPAR model with ridge

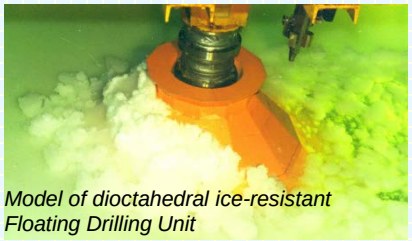

Ice formation on TLP MO


TLP MO model in field of compact simulated ice


Passive turning of FPU for Shtockman Field


Model of hexagonal ice-resistant Floating Drilling Unit


Model of octagonal ice-resistant Floating Drilling Unit

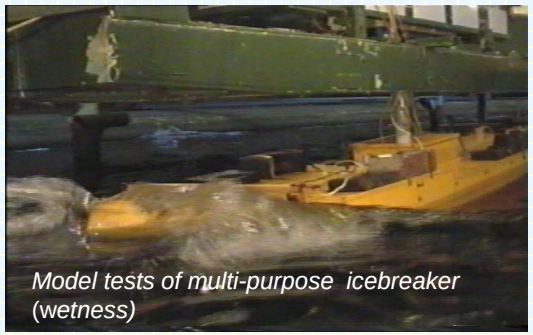

Model of dioctahedral ice-resistant Floating Drilling Unit

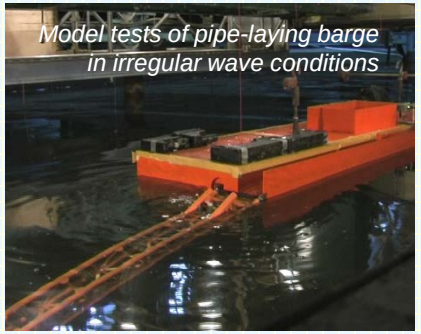

SSFDR for Shtokman – level ice

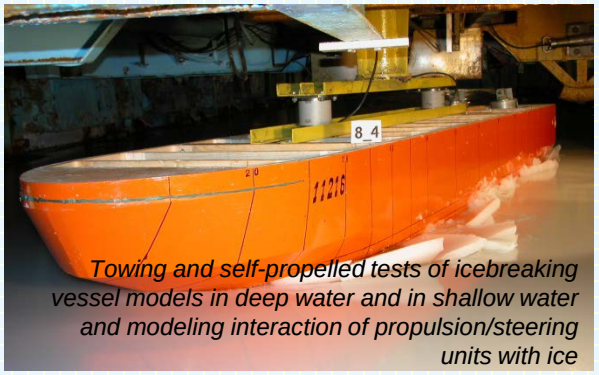

Model of SSFDR Shelf-7

EXPERIMENTAL-ANALYTICAL STUDIES OF VESSELS UNDER ICE CONDITIONS AND IN WAVES


Motions parameters of SEV


Model tests of multi-purpose icebreaker (wetness)

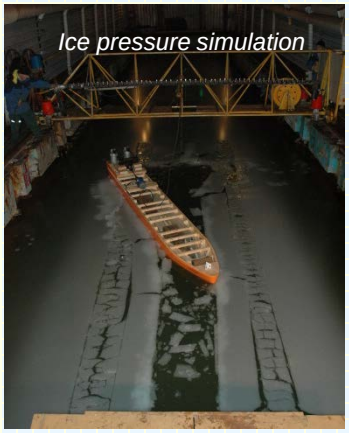

Model tests of pipe-laying barge in irregular wave conditions

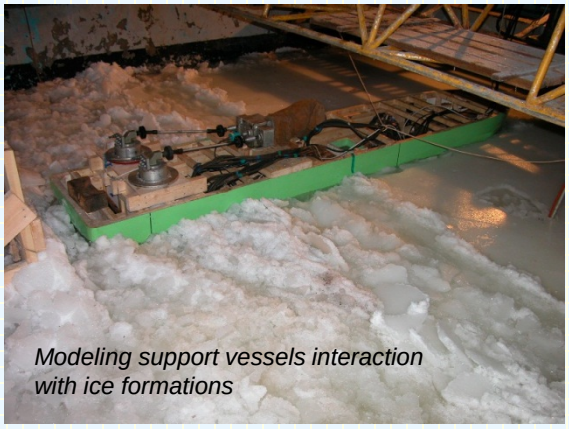

Towing and self-propelled tests of icebreaking vessel models in deep water and in shallow water and modeling interaction of propulsion/steering units with ice


Research into maneuvering qualities of vessels


Model of the gas carrier's hull


Trial of self-propelled model of icebreaker for Sakhalin

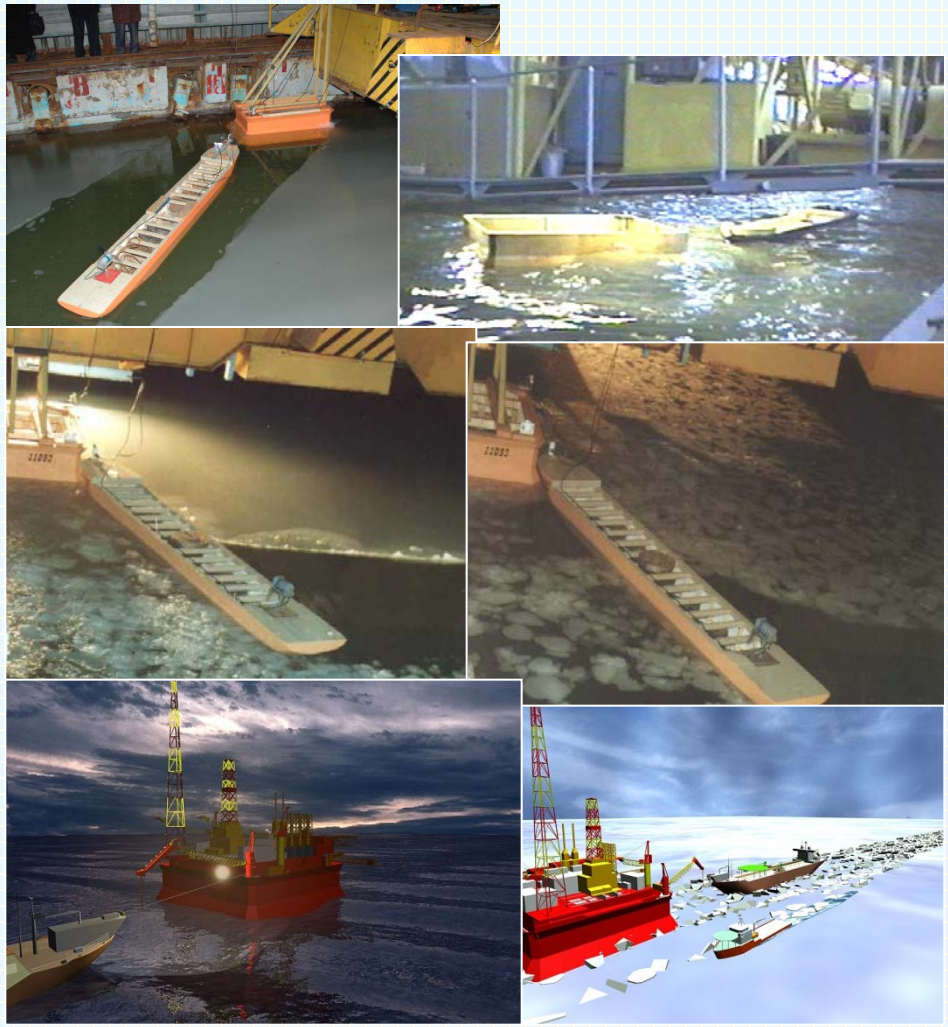

Ice pressure simulation


Modeling support vessels interaction with ice formations


Large-capacity tanker following behind the icebreaker

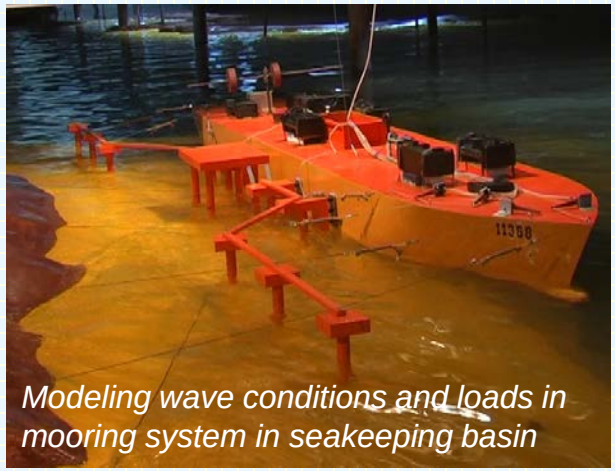
INTEGRATED EXPERIMENTAL-ANALYTICAL STUDIES ON MODELING PARAMETERS OF MOVEMENT, MANEUVERING AND STAYING OF TANKERS AT PLATFORMS AND TERMINALS UNDER ICE CONDITIONS AND IN WAVES

Dynamics of tanker moored at Prirazlomnaya platform



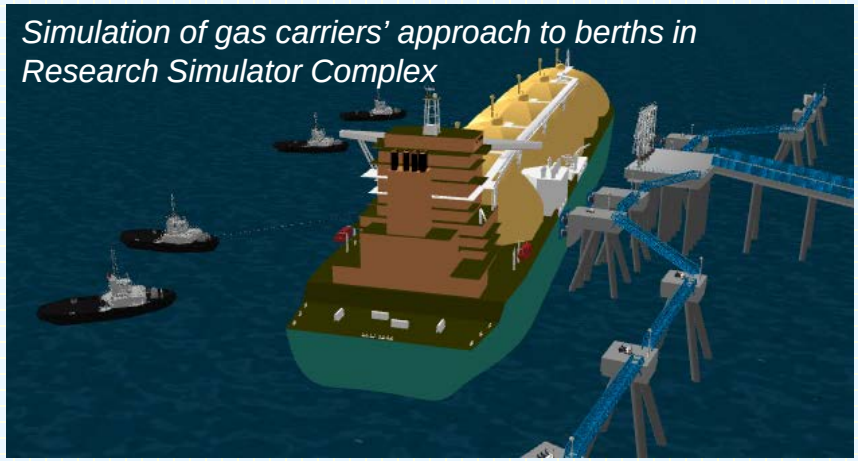
Dynamics of tanker moored at Varandey terminal

CALCULATION AND EXPERIMENTAL STUDY OF OPTIONS FOR SEAPORT BERTHS LOCATION IN THE TERIBERKA BAY WITH REGARD TO WIND AND WAVE CONDITIONS AND GAS CARRIERS MANEUVERING POSSIBILITIES



Modeling wave conditions and loads in mooring system in seakeeping basin

Gas carrier in tunnel's working section



Simulation of gas carriers' approach to berths in Research Simulator Complex

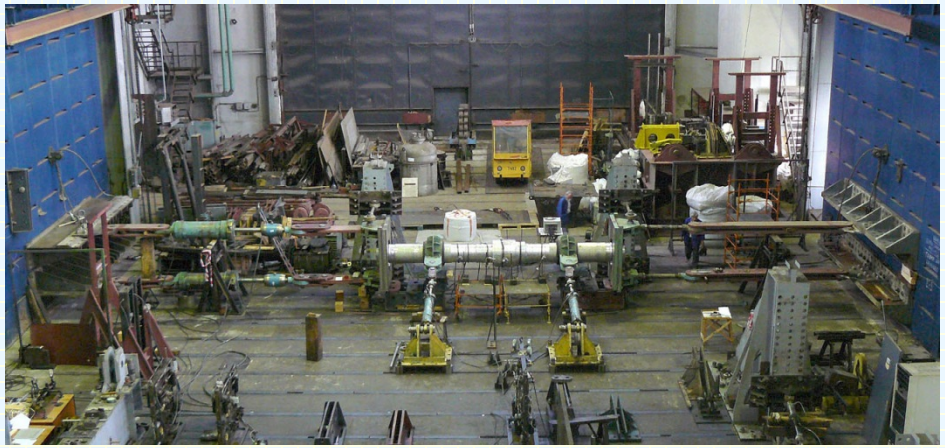
Research into air flow particularities in proposed locations of berthing facilities and in zone of gas carriers' possible maneuvering when approaching the port

LABORATORY OF STRENGTH AND SERVICE LIFE TESTS FOR THE FULL – SCALE STRUCTURES

The laboratory has *DAP certificate* for static and cyclic strength tests performance on experimental large-sized full-scale and model structures as well as their specific joints and details, samples of materials and connections with full-scale thicknesses under conditions of linear, plane and spatial loading, and also stressed-deformed state definition and damageability of the test objects

The Laboratory has the certificate of the Russian Maritime Register of Shipping for industrial products, ontainer and package materials (certificate No 07.00001.003)

The workshop for static and service-life tests on large-sized structures allows implementing arbitrarily oriented loading schemes with forces up to 5000 kN at one point (48*24 meter-sized reinforced floor, reinforced walls and ceiling)

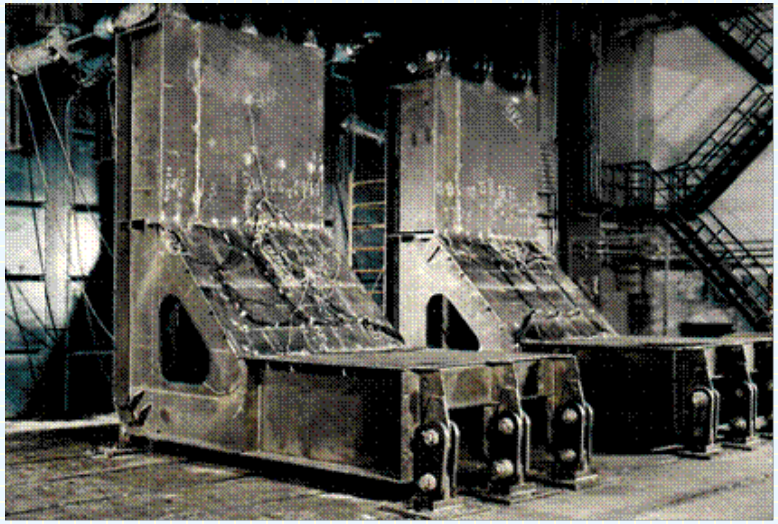


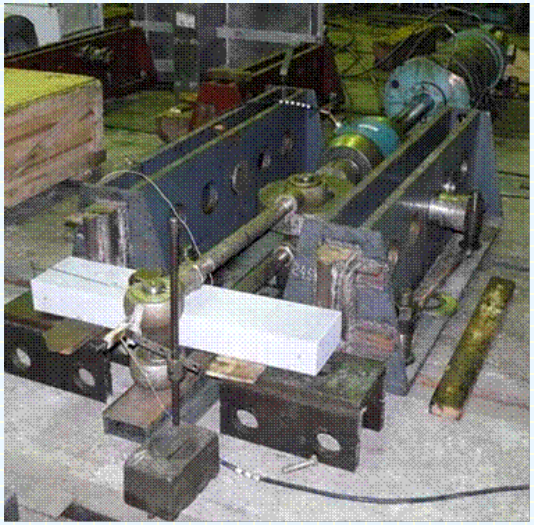
The complex of large-sized test facilities for stretching, compressing and bending full-scale and model samples with forces up to 30000 kN.

Basing on Lab VIEW graphic programming package, the laboratory has developed special software applications to control spatial structure loading process and to ensure real-time multi-channel measurement of the structure parameters

The laboratory is planning to purchase new-generation test facilities with higher capacity

LABORATORY OF STRENGTH AND SERVICE LIFE TESTS FOR THE FULL - SCALE STRUCTURES





Studies of metal properties and welds on sheets with thickness up to 100 mm for the vessels and structures operating at cold temperatures on the Arctic shelf (according to the requirements of Lloyd's Register Rules for the Manufacture, Testing and Certification of Materials, as well as to BS7448-1, BS7448-2 and ASTM E208 standards)

Fatigue strength studies for semi-full-scale large-sized (4*4*4m) joints between double side and double bottom for bulk carriers (the studies were ordered by Lloyd's Register)

Vibration strength studies under cyclic bending condition for the full-scale block (area about 20 m2) of No 96 membrane insulation for the LNG carriers operating in the Arctic, performed for Gaztransport & Technigaz (GTT, France) in order to confirm guaranteed service life of not less than 40 years

DESIGN-EXPERIMENTAL STUDY ON TRANSPORT SYSTEMS FOR EXPORTING LIQUEFIED NATURAL GAS

Technical requirements development for liquefied natural gas transportation system under the Shtokman project

- New gas-carriers design substantiation for OAO "Gazprom"
- Technical requirements definition for liquefied gas offshore transportation system

Hull lines optimization for promising twin-shaft LNG gas-carriers

Efficiency of the Institute developed vessel's twin-shaft hull lines is 8-10% higher than that of similar foreign variants

Sea-keeping tests of LNG - floating terminal complex

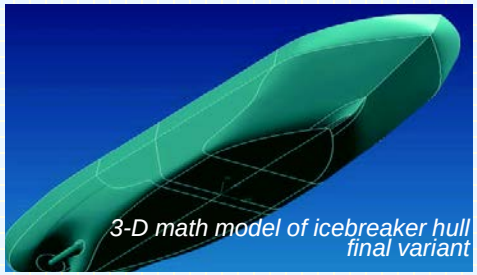
Characteristics of oscillations for both models with six degrees of freedom, accelerations in specified points, as well as dynamic loads in mooring ropes, fenders and anchoring lines of turret-type station-keeping system were obtained

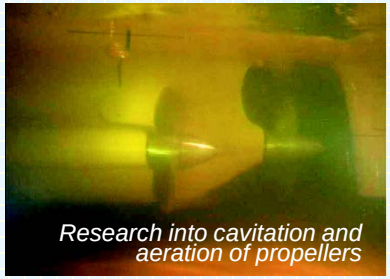
Researches of features of LNG carriers operation in the Arctic conditions

Research of propulsion qualities in ice of LNG carrier intended for operation in ice conditions, and also designing its propellers was carried out

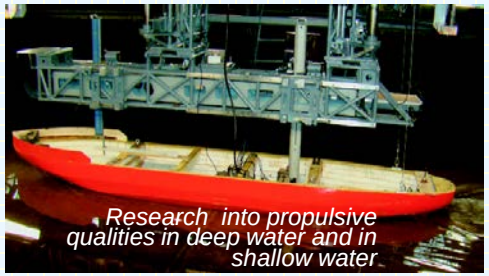
The conducted full-scale tests have acknowledged completely the institute's recommendations which have been realized by the designer

EXPERIMENTAL STUDIES OF MULTI-PURPOSE NUCLEAR POWERED ICEBREAKER IN HYDRODYNAMIC, CAVITATION, SEAKEEPING AND ICE MODEL BASINS

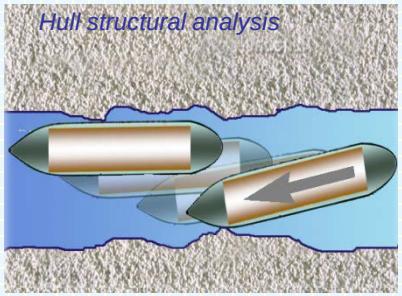

3-D math model of icebreaker hull final variant


Research into cavitation and aeration of propellers


Research into seakeeping qualities

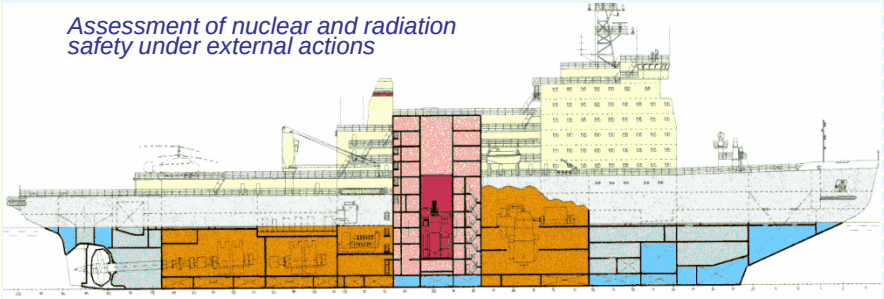

Research into propulsive qualities in deep water and in shallow water

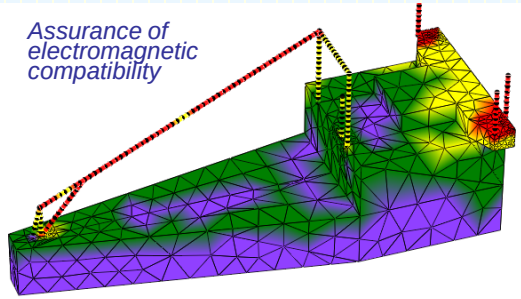

Research in ice-going qualities and maneuverability


Hull structural analysis


Assurance of low vibration levels

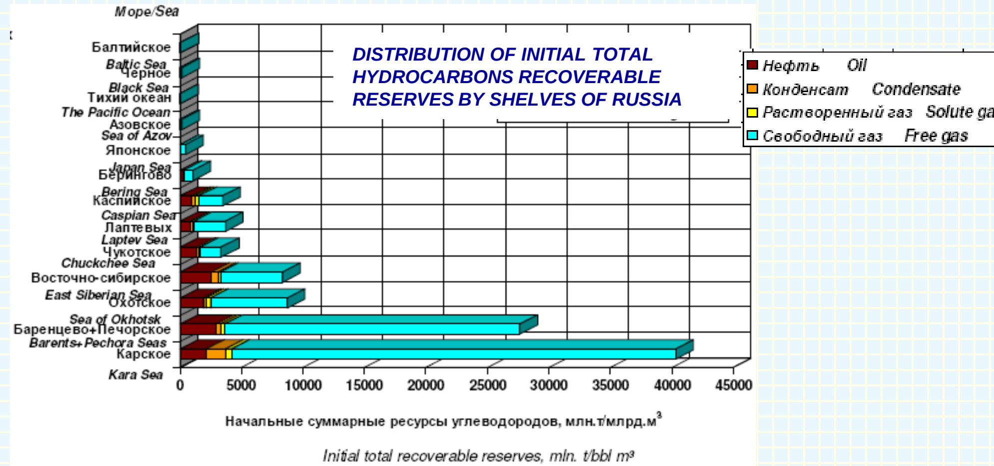

Rational shaft line system was developed

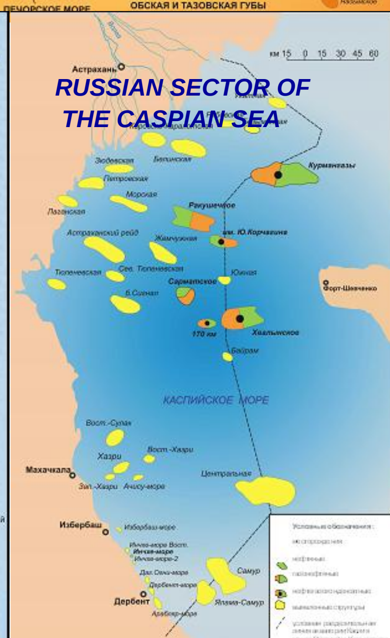

Assessment of nuclear and radiation safety under external actions

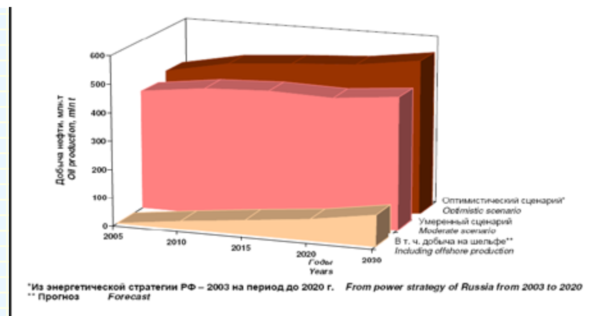

Assurance of electromagnetic compatibility

MAIN DESIGN STUDIES FOR OFFSHORE PROJECTS

CONTINENTAL SHELF – RESOURCE BASIS FOR THE OIL AND GAS INDUSTRY DEVELOPMENT IN RUSSIA IN XXI CENTURY

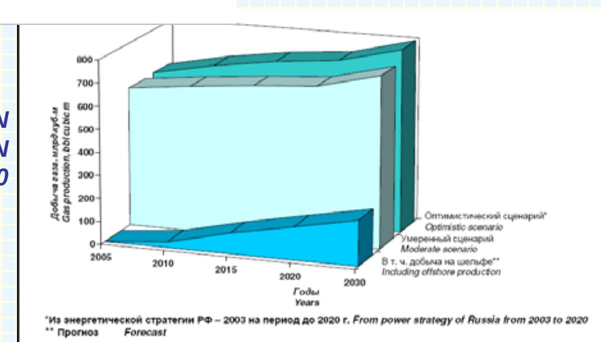






OIL PRODUCTION UP IN RUSSIA AND ON RUSSIAN SHELF UNTIL 2030

GAS PRODUCTION UP IN RUSSIA AND ON RUSSIAN SHELF UNTIL 2030



TOP-PRIORITY OFFSHORE PROJECTS WITH PARTICIPATION OF OAO "GAZPROM" AND ITS AFFILIATES

- Shtokman gas and condensate field in the Barents Sea
- Fault-line fields and a number of nearby structures (Varandey-more, Medynskaya-more, Yuzhnaya and Severnaya Dolginskaya) in the Pechora Sea
- Fields of Yamal shelf in the Kara Sea: deep water (Rusanovskoye, Leningradskoye), mid-water (Kharasaveyskoye), and utmost shallow (Kruzenshternovskoye)
- Fields of Ob and Tazov Bays (the Kara Sea)
- Sakhalin-2 project (Piltun-Astokhskoye oil field and Lunskoye gas field on the Northeastern coast of Sakhalin island, the Sea of Okhotsk
- Sakhalin-3 (Kirinskiy Ayashskiy, Vostochno-Odoptinskiy blocks on the Northeast cost of Sakhalin island, the Sea of Okhotsk)
- Zapadno-Kamchatskiy oil and gas basin
- Laganskiy license block in the Russian sector of the Caspian Sea

LIST OF MAIN VESSELS AND FLOATING UNITS FOR ENSURING OFFSHORE OIL AND GAS PRODUCTION

➢ **Floating drilling rigs**

➢ **Floating technological platforms**

➢ **Research vessels**
- geophysical
- hydrographic
- geotechnical

➢ **Technical fleet vessels**
- Crane vessels and derrick barges
- Transportaion barges and sludge removal vessels
- Dredgers
- Floating pile drivers
- Concrete vessels
- Pipeline laying and pipe deepening
- Vessels for laying flexible pipes and cables

➢ **Vessels for subsea technical works**
- Diving works
- Providing submarines
- Subsea pipelines repair
- Well repair with subsea completion

➢ **Service fleet vessels**
- Multi-purpose and special-purpose supply vessels, anchor handling/tug/supply vessels
- Tug boats, docking tugs, anchor handlers
- Ice-breakers
- Smaller floating crafts (pontoons, hulks, lighters)

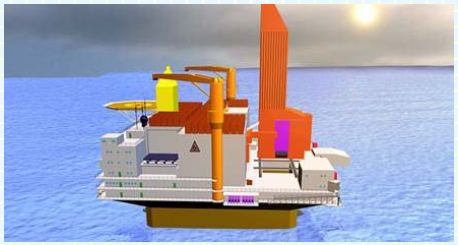
➢ **Vessels of supply-supplemental fleet**
- Rescue vessels
- Fire rescue vessels
- Passenger-carrying vessels
- General service launches
- Oil garbage disposal vessels, bilge water removing ships
- Fuelers, water carrying boats
- Guardships, floating workshops
- Floating berths

➢ **Vessels and floating crafts of transport-technological system**
- LNG carriers
- Shuttle and line tanker
- Floating (underwater) oil storages
- Floating offshore shipping berths

TECHNICAL MEANS CONCERNING WHICH THE INSTITUTE CONDUCT WORKS CURRENTLY

Shtokman field LNG tankers (capacity – 150-200 th.m³)

Offshore floating system for gas intake, preparation, and transfer from Shtokman field by pipelines to shore



Offshore ice-resistant drilling rig for exploratory drilling in shallow ice regions

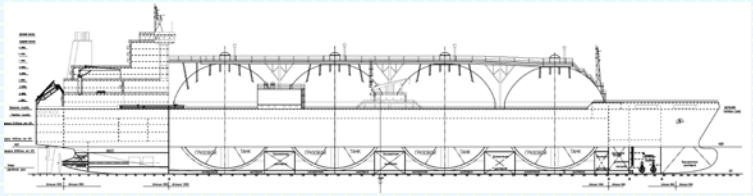
Semi-submersible drilling platforms

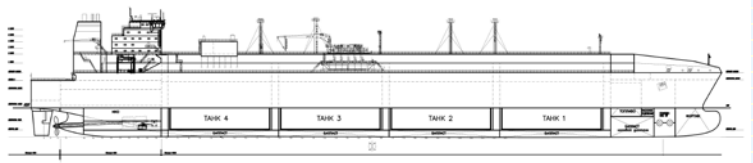
CONCEPTUAL PROJECTS OF LIQUEFIED NATURAL GAS CARRIERS WITH CAPACITIES of 155 AND 215 thousand m^3 WITH VARIOUS TYPES OF TANKS

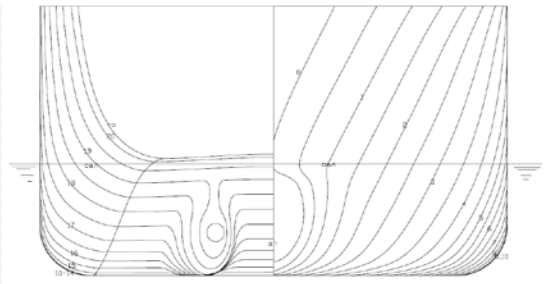
LNG carriers with spherical tanks of Moss type

LNG carriers with prismatic tanks of SPB type

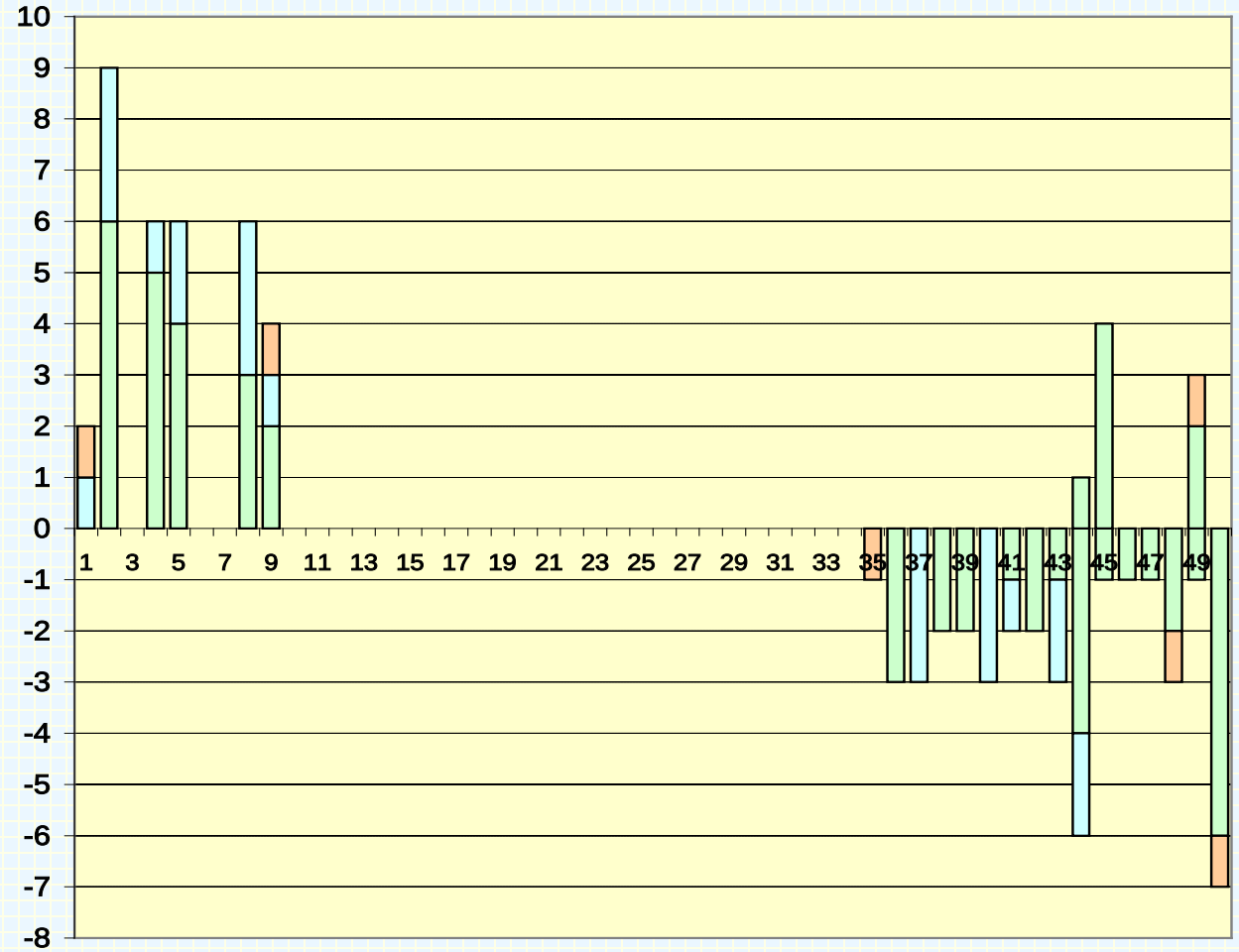
Type of cryogenic tanks	SPB	Moss	SPB	Moss
Capacity, m^3	215 000	215 000	155 000	155 000
Number of tanks	5	5	4	4
Service speed, knots	19.5	19.5	19.5	19.5
Overall length, m	326	335	305	298
Midship width, m	53	51	47	50
Depth, m	27	30	26.5	27.5
Height of trunk deck, m	34.5	-	33	-
Summer draft, m	12.4	12.4	11.8	11.8
Design draft, m	12	12	11.5	11.5
Design displacement, t	154 800	153 300	120 000	117 500
Lightship displacement, t	51 080	49 200	41 200	40 600







QUANTITATIVE DEMAND FOR LNG VESSELS
(On the grounds of open sources materials to complex development of Shtokman oil and condensate field, 2007)



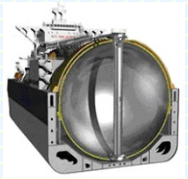
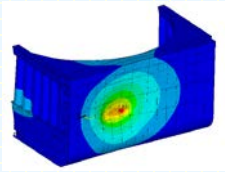
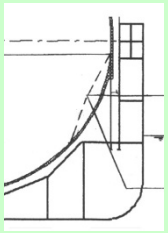
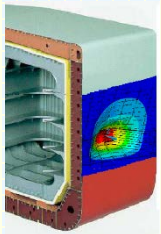
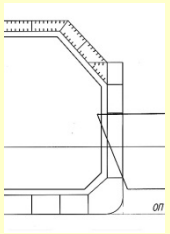
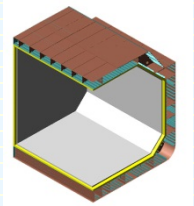
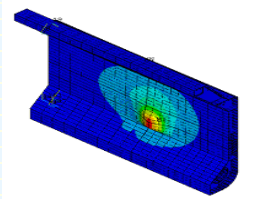
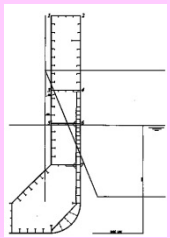
Vessels with tonnage of 150-170 th. m³ for transportation to European terminals

Vessels with tonnage of 150-170 th. m³ for transportation to the East cost of the USA and Canada

Vessels with tonnage of 200-220 th. m³ for transportation to terminals of the Gulf of Mexico

Total demand for LNG vessels of Shtokman gas and condensate field until 2020 will make about 23 units

COMPARISON OF SAFETY OF LNG CARRIERS WITH VARIOUS TYPES OF CAPACITIES DURING INTERACTION WITH ICE AND COLLISION

Cargo tank type	Ice loads			Navigating accident – ramming of support vessel with displacement of 15 000 tons
	Operational	Emergency possible one time over operational period	Collision with floeberg	
MOSS 	Strength is ensured	Strength is ensured with great reserve 	**Flooding of ballast compartments of second side**	 **Critical speed for breaking of cargo tank V=14 knots**
SPB 	Strength is ensured	Strength is ensured with reserve 	**Flooding of hold and contact of cargo tank with water is possible**	 **Critical speed for breaking of cargo tank V=5 knots**
Membrane 	Strength is ensured	Strength is ensured 	**Breakup of cargo tank is possible**	 **Critical speed for breaking of cargo tank V=3 knots**

DEVELOPMENT OF DESIGN DOCUMENTATION FOR SHIP TYPE PROCESSING PLATFORMS FOR SHTOKMAN GAS AND CONDENSATE FIELD

OIRPP Main Particulars

Length overall	**310 m**
Breadth at Main Deck	**60 m**
Depth	**26 m**
Draft	**18 m**

Key results of the study:

- Processing facilities were selected
- Main dimensions were determined
- Hull, systems and equipment weights were estimated
- Seakeeping, unsinkability and maneuverability parameters were determined
- Particularities of OIRPP behavior in ice conditions were considered
- Different options for gas condensate storage and offloading were analyzed
- Solutions for structure position keeping/positioning system were suggested

PROJECT OF SEMISUBMERSIBLE DRILLING RIG FOR WELL DRILLING AT SHTOKMAN GAS AND CONDENSATE FIELD

Maximum drilling depth 7 500 m
Water depth 70-500 m

Performance capability
Deck sizes 83,2x72,72 m
Height up to a derrick floor 52,12 m

Pontoon sizes 118,56x15,73x10,15 m
Corner column sizes 13,44x12,8 m

Draft at operation / transition 23,5/9,85 m
Displacement 54 700 ton
Static loading on a hook 680 mt
Maximum overhead drive pressure 750 t

Sea and technological stores:
drinking water 775 m3
process water 1520 m3
diesel oil 3100 m3
drilling mud 2190 m3

Environment:
Air temperature from -30 up to +45 0C
Design wave height 32 m
Design wind rate 55 m/s

Builder	Vyborg Shipbuilding yard
License project	Moss Maritime
Project documentation	Krylov Shipbuilding Research Institute
Main unit delivery	2011
Quantity	2 units

DEVELOPMENTS OF THE INSTITUTE FOR ICEBREAKERS

Linear icebreaker for the Baltic Sea ЛК-18

Main characteristics:		Works of Krylov Institute
Length overall, m	114.0	Conceptual design Model tests in ice and open water Preliminary design Scientific support of detailed design Author's support of 2 ships building at the Baltic shipyard. Preparation for sea trails
Beam, m	27.5	
Amidships depth up to upper deck, m	12.4	
Draft on design waterline, m	8.5	
Propeller power (2x8000), KW	16000	
Icebreaking capability, m	1.5	
Speed, knots	16.0	

Multi-purpose icebreaking ship for FOIRP «Prirazlomnoe» MOSS 828

Main characteristics:		Works of Krylov Institute
Length overall, m	99.3	Examination of the design Model tests in ice and open water. Refining the hull shape Full-scale ice tests of multi-purpose icebreaking ship «Yiniy Topchev» in the Kara Sea has acknowledged both the results of model tests and recommendations of the Institute for optimization of hull configuration
Width at draft of 8.5 m, m	19.0	
Amidships depth up to upper deck, m	1.5	
Draft on design waterline, m	8.0	
Propeller power (2x7500), KW	15000	
Icebreaking capability, m	1.5	
Speed, knots	17.0	

Ice Breaking Vessel IBEEV

Main characteristics:		Works of Krylov Institute
Length, m	45.1	Full-scale ice tests in Kaspian Sea and recommendations of the Institute for optimization of hull form
Beam, m	8.0	
Amidships depth up to upper deck, m		
Draft on design waterline, m	2.0	
Propeller power (2x550), KW	1100	
Icebreaking capability, m	0.6	
Speed, knots	ab. 8.5	

Harbour icebreaking tug ЛК-4 Built - 2004- 2005

Main characteristics:		Works of Krylov Institute
Length, m	35.0	Preliminary design Full-scale ice trials in the port of Primorsk were performed Full-scale ice tests in the port of Primorsk have acknowledged both the results of model tests and recommendations of the Institute for optimization of hull configuration
Beam, m	12.8	
Amidships depth up to upper deck, m	5.8	
Draft on design waterline, m	4.5	
Propeller power (2x2000), KW	4000	
Icebreaking capability, m	ab. 0.8	
Speed, knots	13.5	
Design pull, tons	65	

SUPPLY VESSELS, CREW BOATS FOR FLOATING DRILLING RIGS / PLATFORMS AND OTHER SERVICE VESSELS DEVELOPED FOR OAO GAZPROM

FOR SERVICING JACK-UP DRILLING RIG «ARCTICHESKAYA»

Supply, participation in oil spill response Project № 22370

Supply Project № 22380

FOR SERVICING SEMISUBMERSIBLE DRILLING PLATFORMS

Supply, anchor-handling, participation in oil spill response. Project № 22390

Supply Project № 22420

FOR SERVICING OFFSHORE ICE-RESISTANT DRILLING UNIT

Supply Project № 22450

FOR SERVICING FLOATING DRILLING UNIT / PLATFORMS

Supply, towage, anchor-handling. Project № 22430

Crew delivery Project № 22480

GENERAL PURPOSE

Tug for harbour and offshore operations Project № 22440

GENERAL PURPOSE

Oil skimmer Project № 22490

Diving boat Project № 22470

Crew boat Project № 22510

Special crew boat

CONCEPTUAL DESIGN OF COMPRESSED NATURAL GAS CARRIER (CNG)

Ship basic parameters:

Length, m	**230**
Breadth, m	**35**
Depth, m	**23.3**
Cylinder diameter, m	**2.5**
Cylinder height, m	**20**

Name	Dimension	X80 (Steel)	T-700S (CFK)
Displacement D	t	101053	40175
Loaded draft, T	m	14.74	5.86
Operating pressure, P_{op}	atm	250	250
Internal volume of one cylinder	m^3	78.46	85.15
Number of cylinders, n_{cyl}	–	536	536
Cylinder weight, M_{cyl}	t	63205	7967
Gas volume carried, $V_{gas\ atm}$	mln. m^3	11.69	12.68
Gas weight carried, M_{gas}	t	8379	9093
Ship cost	mln. €	197	299

OFFSHORE HELICOPTER PLATFORM FOR SHTOKMAN GAS AND CONDENSATE FIELD

Preliminary characteristics

Deck length, mabout 80

Deck width, mabout 70

SEA OPERATIONS

Thank you for your attention!