

STATE SCIENTIFIC RESEARCH CENTER OF THE RUSSIAN FEDERATION



JSC SSTC STRUCTURE AND MAIN FIELDS OF ACTIVITY

SUDOTECHNOLOGIYA Research - Technical Company

Technological support of	Development of
ship and vessel design,	advanced technologies
construction and repair	for shipbuilding

Design and production of technological equipment

Development of technologies	Application of
and projects for disposal of	information
nuclear-powered ship and	technologies in
nuclear support vessel	shipbuilding

ARMAS Design Bureau

Development, production and testing of shipborne pipeline valves and fittings

RUMB Research Center

Price formation, labor intensiveness, labor standardization and technical-economic expertise

SOYUZPROEKTVERF Design Company

Creation, re-equipping and reconstruction of shipbuilding and ship repair enterprises, hydraulic facilities and mechanical-engineering enterprises

Foreign Economic Company

Promotion of JSC SSTC's products and services to foreign markets, foreign economic activities and international cooperation, design and technological support for foreign customers' ships' and vessels' repair, maintenance and stationing at base

VOSTOK Design Bureau

Design of fishing, research and other types of vessels

SSTC Vietnam, Moscow, Severodvinsk Representative Offices





PROJECTS OF CONSTRUCTION, RE-EQUIPPING AND RECONSTRUCTION OF SHIPBUILDING ENTERPRISES

PROJECTS OF CONSTRUCTION, RENOVATION AND AUGMENTATION OF SHIPBUILDING FACILITIES



- Yards for construction and repair of any type ships
- Hydraulic structures (dry docks, slips, sloped and horizontal building jigs, quays, piers, dams etc.)
- Marine machinery and marine equipment production facilities
- Facilities for offshore marine equipment construction
- Power supply facilities (transformer substations, HP and LP compressor stations, gasification stations, boiler plants etc.)
- Environment (air, soil, water) protection facilities
- Objects for ships and vessels utilization
- Objects of onshore infrastructure and naval basement of ships and vessels

JSC SSC ZVEZDA: SHIPBUILDING COMPLEX FOR HEAVY-TONNAGE VESSELS PRODUCTION



Purpose: production of heavy-tonnage vessels (tankers, LNG carriers), ice-class supply vessels with max. deadweight up to 350,000 tons and offshore rigs Annual production rate – up to 330,000 tons

NEW SHIPBUILDING FACILITY ON THE ISLAND OF KOTLIN



Purpose: production of heavy-tonnage vessels, first rank ships and marine equipment (ice-class crude oil carrier, of max. 100,000 tons deadweight, LNG-carriers of max. capacity 250,000 m³, mining vessels of FPSO, semisubmersible drilling rigs, etc.). Annual metal processing rate – up to 140,000 tons Overall personnel – 5,100 persons

NEW HIGH-TECH SHIPYARD IN THE REPUBLIC OF SAKHA (YAKUTIA)



Event: "Modernization and development of Russian production facilities for building modern inland river vessels" Products: river vessels and barges (oil barges, bulk-cargo barges, tug boats, auxiliary vessels), max. length – 110 m, max. breadth – 18 m, max. light displacement 1,000 tons. Annual metal processing rate – up to 10,000 tons Overall personnel – 1,000 persons

JSC BALTIC SHIPYARD RECONSTRUCTION AND TECHNICAL RE-EQUIPMENT



Event: Reconstruction and retooling of hull processing, welding and assembly facilities of JSC "Baltic Shipyard". Establishment of mega-block construction shop.

Production: outfitted sections and blocks with max. dimensions of 24,000x24,000x6,000 and weight 1,100 t. Annual metal processing rate – **up to 60,000 tons** Overall personnel – **up to 360 persons**

RECONSTRUCTION OF TRANSFER COMPLEX AT JSC PA "SEVMASH"

<image>

Phase 1 construction:

- Overall reconstruction area: 180 000 m²
- Transfer of blocks of max. 2000 t weight

Phase 2 construction:

- Overall reconstruction area: 50 000 m²
- Transfer of blocks of max. 2000 t weight

JSC PA "SEVMASH" PROSPECTIVE PROJECTS

On-site facility of covered berth No.1

- Overall construction area: 7,000 m²
- Sanitary capacity: 1,500 persons, facility personell: 50 persons

HPA cylinders test facility

- Overall construction area: 700 m²
- Testing HPA cylinders for main production facilities

JSC SC "ZVYOZDOCHKA" TEST AND ASSEMBLY SHOP FOR MECHANICAL PROPELLER-RUDDER SYSTEMS

Test and assembly shop for mechanical propeller-rudder system was built and commissioned in 2016. IT is supposed to build domestic propulsion systems for ships and vessels. Production shop for new types of propulsion systems is logical extension of original shop. Once completed, both shops shall be merged.

JSC "ADMIRALTY SHIPYARDS" TECHNICAL RETOOLING AND RECONSTRUCTION OF SPECIAL-PURPOSED FACILITIES FOR DIESEL-ELECTRIC SUBMARINES

Overall construction, reconstruction and retooling area – 58,300 sq.m Overall personnel – over 1900 persons

JSC "ONEGO SHIPYARD" CONSTRUCTION, RECONSTRUCTION, AND RETOOLING (OVERHAUL) OF PRODUCTION FACILITIES

Overall construction, reconstruction and retooling area – 25,900 sq.m Overall personnel – 550 persons

TECHNOLOGICAL SUPPORT OF SHIP AND VESSEL DESIGN, CONSTRUCTION AND REPAIR

RESEARCH ACTIVITIES IN THE AREAS OF:

- IT, simulation of complex engineering systems and processes
- Full-size simulation of assembly and welding of hull structures
- Hull structures welding with adaptive computer-controlled equipment
- Cold bending of blanks of shipbuilding steels by local and rotary local deformation techniques
- Installation of nuclear power plants, propulsion plants, and complex elements of shipboard equipment
- Fabrication and installation of shipboard pipelines upon studies based on the new techniques of solid-state modeling
- Installation and repair of weapons and sensors
- Information technologies and electronic measurement systems
- Composite structures construction procedures
- Hydro-acoustic coating application techniques
- Examination of acoustic properties of the advanced materials and universal air noise and vibration protections
- Assessment of tightness of radiation and environmentally dangerous facilities for designing, construction and operation
- Research studies and gathering knowledge in the safety of the nuclear power facilities
- Development of shipboard pipe fittings using new materials with better performance

PRINCIPAL TECHNOLOGIES FOR SHIP CONSTRUCTION

DESIGN TECHNOLOGY AND CONSTRUCTION MANAGEMENT OF LEAD ICE-BREAKER "Leader" Pr. 10510

Construction procedures of "Leader" ice-breaker developed by SSTC are intended to ensure construction efficiency with minimum labor intensity and duration.

Ice-breaker accommodation in dry dock

Equipment layout diagram at assembly and welding area (utilizing welding robots) for MVZ tanks

Robotized welding site for protective units

TECHNOLOGIES FOR PROVIDING CLEANLINESS OF INNER HOLLOWS IN SHIPBORNE SYSTEMS

JSC SSTC is a major technological company in shipbuilding sector to develop and implement regulatory environment to maintain cleanliness of inner hollows in shipborne systems:

- For nuclear STG systems ППУ OCTB5P.95121—2013 "Ships. Nuclear Propulsion Plants. Standard procedures to maintain cleanliness of inner hollows in equipment and (in exchange to documents PДB5.9684—80, OCTB5.9911—83 and in accordance with OCT95 306 rev. 7).
- For water cooling systems ЛКИБ.3330 055 2014 "Water cooling systems of projects Yasen'-M and Borey-A. Principal procedure to maintain cleanliness".
- For oil systems ПТУ ЛКИБ.3310-170-2014 "Oil systems of projects Yasen'-M and Borey-A. Principal procedure to maintain cleanliness".
- For hydraulic systems OCT5P.5599-92 "Hydraulic systems. Manufacturing and installation. Basic principles".

PRINCIPAL TECHNOLOGY OF 3D MEASUREMENT

On the left: a photo of auxiliary machinery room of the ship Academician Treshnikov; on the right: points cloud of the same

SCOPE OF TASKS, RESOLVED BY STATE-OF-ART MEASUREMENT EQUIPMENT

- High-precision and complicated measurement of geometrical parameters of complex-shaped objects, measurement results are recorded automatically;
- Geometrical check of products at all manufacturing stages, starting from preparation to final assembly – in order to exclude accumulated manufacturing errors;
- Static and dynamic monitoring of shape and dimensions of objects;
- Parametrical certification of supporting structures of highprecision technological equipment;
- Metrological support of equipment modular installation procedures;
- Marking without patterns.

COLD BENDING PROCEDURES BY MEANS OF LOCAL DEFORMING METHODS

Cold bending of bulkhead sections of nuclear-powered submarines "Borei-A", "Yasen-M", etc. at JSC PA "Sevmash"

Goal – development and implementation of plates (80-100 mm) from high-tensile steel and titanium in cold state by means of local deforming method

Economic savings – 15-20 – 72 million roubles per ship caused by shifting from hot bending (at contractor's facility) to cold bending at JSC PA "Sevmash" w/o die manufacturing (reduction of power consumption and labor intensity, exclusion of various production procedures)

OPTIMIZATION OF WELDING AND ASSEMBLY PROCEDURES BASED ON ESTIMATION OF WELDING DEFORMATIONS

Model of welding deformations at catamaran's bottom section

Model of welding deformations of trunk embedded in main hull

Model of welding deformations at flat bulkhead of "Yasen-M" project.

Application of finite elements method allows to estimate welding deformations of most complex ship structures, including curved 3D-sections.

Estimation results are used to optimize welding and assembly procedures as well as to decrease and compensate welding deformations.

LOW-FREQUENCY VIBRATION TREATMENT TECHNOLOGY AND EQUIPMENT

Results of modal analysis of tower hoist, "Lada" project

LFVT process equipment

- Low-frequency vibration treatment (LFVT) is purposed for reducing residual stresses in weld structures, stabilizing their shape and size, and for improving cyclic fatigue strength
- LFVT is a good alternative to heat treatment which is expensive and power-intensive
- Application of modal analysis and finite elements method to define LFVT patterns and models helps to maximize its efficiency
- New LFVT equipment with microprocessor control greatly increases serviceability, automates operator's common actions, provides on-line monitoring of vibration parameters and extended operating band, allows to reduce weight and dimensions of power unit and has modern ergonomic design

PRINCIPAL LEAK TEST PROCEDURES IN SHIPBUILDING AND SHIPREPAIR INDUSTRY

Leak-tightness check of protective shells of shipboard nuclear-powered steam plants

Contracts signed with JSC "Baltic shipyard", JSC "Severnoe DB", JSC "CDB Iceberg" for participation in leak tests of protective casings of ships Pr. 05711 (FPB), ship No. 05706, 05707, 05708 (Pr.22220 ice-breaker, Arctic class), development of test manual for local and integral leak tightness of ship 11442M (NPMC "Admiral Nakhimov"), protective shells of Pr.10510, (Leader-class ice-breaker).

Development of principal technologies for assembly, check and leak tests of special articles and their components. Leak tests of article's pilot structures and joints

Contract with JSC "CDB ME "Rubin", for rendering R&D works "Development of principal procedures for assembly, check and trials of leak tightness of articles and their components".

DESIGN AND PRODUCTION OF TECHNOLOGICAL EQUIPMENT

DESIGN AND PRODUCTION OF PROCESS EQUIPMENT

- Process equipment for hull fabrication, welding, piping, and mechanical installation shops
- Equipment for ship disposal, composite material processing, radioactive materials handling
- Ship construction, lifting and launching equipment
- Electric drives, electric equipment, control systems

THERMAL CUTTING TECHNOLOGIES AND EQUIPMENT

Various kinds of thermal cutting can be used:

- Plasma
- Oxygen

– Laser

Thickness of plate to be cut (mm)

4 to 100 (plasma) to 200 (oxygen) 1 to 20 (laser)

Travel speed (m/min) Travel error (mm) Processing area (m) 0.07-12 ± 0.1 up to 4.5x24

TECHNOLOGY AND EQUIPMENT FOR LASER CUTTING, MARKING AND LABELING WITH FIBER OPTIC LASERS

- Automatic precision cutting, marking and labeling of plates up to 2.5 x 10 m
- Max. cutting error no more than 0.1 mm
- Thickness of plates from 1 to 20 mm
- High cutting speed up to 60 m/min
- 2-3 times power and operational savings in comparison to gas laser machines

TECHNOLOGY AND EQUIPMENT FOR ROTARY LOCAL FORMATION OF PLATES

Multifunctional bending and straightening machine *MGPS-25*

Multifunctional bending and straightening machine *MGPS-100*

Parts for driver cabin of the new generation electric train Parts for Zubr-type hovercraft

The technology offers:

- 4-6 times lower power consumption
 - 17-30 times lower metal consumption as die tooling and test tooling are not required
- 4-5 times lower labor input of bending
- Bending and shape testing are fully automated
- 4.

Maximum bending force – 250 to 1000 kN Maximum plate thickness –

20 mm (MGPS-25) or 30 mm (MGPS-100) Maximum plate width – 2500 mm

MULTIFUNCTIONAL BENDING AND STRAIGTHENING MACHINES

MGPS-25

Maximum bending force (kN) – 250 Maximum plate thickness (mm) – 20

Maximum plate width (mm) – 2500

12 bending machines MGPS-25 were supplied to 8 shipyards, 2 rail carriage building plants, 2 foreign ship repair plants, including JSC Almaz Marine Yard, JSC Eastern Shipyard, JSC Khabarovskiy Shipbuilding Plant, JSC SSC Zvezda, Astrakhan Ship Repair Yard, Krasnaya Kuznitsa Ship Repair Yard and others

MGPS-100

Maximum bending force (kN) – 1000 Maximum plate thickness (mm) – 30

Maximum plate width (mm) – 2500

3 bending machines MGPS-100 were supplied to 2 Russian shipyards (Astrakhan Ship Repair Yard and JSC SSC Zvezda) and 1 foreign ship repair plant

COMPLEX OF EQUIPMENT FOR MECHANIZED ASSEMBLY AND ROBOTIZED WELDING OF MICROPANELS

The complex is designed for:

- Mechanized positioning and tacking of webs;
- Laser scanning with photogrammetry of operation zone;
- Automatic data processing and generation of control program for the robot;
- Robotized welding of micropanels.

Main advantages:

- implement unattended manufacturing of wide range of ship hull panels;
- make welding joints of guaranteed quality;
- increase productivity of welded structures manufacturing in 1.5-2 times by reducing time required for preparation and final welding stages;
- reduce residual stresses in weld structures.

COMPLEX OF EQUIPMENT FOR LASER CUTTING AND HYBRID LASER/ARC WELDING OF FLAT PANELS

The complex is designed for precise automated processing (cutting and welding) of plate parts up to 3.2x12 m

Hybrid laser/arc

welding of stiffeners

Laser grooving

Hybrid laser/arc welding thickening of plates (4-20 mm)

Main advantages:

- laser grooving;
- single-pass hybrid laser/arc welding of butt joints (plate thickness up to 20 mm);
- 2–2.5 times reduction of specific energy consumption of welding;
- reduce welding material consumption by 40–60%;
- 2–3 times increase of welding productivity;
- minimize residual welding deformations and stresses

ROBOTIZED COMPLEX FOR PRECISE LASER CUTTING AND WELDING

Main advantages of the complex:

- Processing of complex-shaped 3D structures in any position;
- Automated laser cutting and hybrid laser/arc welding;
- Performing welding and cutting at one position without shifting the article;
- Wide range of processed materials thickness;
- High reliability and low operational costs;
- High productivity.

Complex specification:

- Laser power: up to 25 kW
- Welding current, max: 500 A
- Thickness of materials for cutting:
 - Steel: 1-25 mm
 - Aluminium: 1-12 mm
- Thickness of materials for welding:
 - Steel : 1-20 mm
 - Aluminium : 1-12 mm
- Processing zone: 8000x2500x1500 mm
- Position accuracy: 0.15 mm
- Processing speed, max: 6 m/min

ARC AUGMENTED LASER WELDING SYSTEM "ORBITA"

System composition		
Name	Item	
Ytterbium fiber laser	1	
Chiller	2	
Welding source	3	
Feed device	4	
Guiding belt	5	
Carriage	6	
Arc augmented laser module	7	
Laser welding head	8	
Welding torch	9	
Monitoring system	10	
Control rack	11	
Control panel	12	
Distribution cabinet	13	
Compressor station	14	

Complex for arc augmented laser welding of joints is intended for use at shipbuilding yards for production of complex 3D hull structures with minimum tolerances

Min. 10
Min. 400
3,5
16
PF, PG, PH, PJ

ROBOTIZED COMPLEX FOR WELDING OF MARINE ENGINEERING ARTICLES

The complex is designed for:

- Manufacturing of heat exchangers tube plates (laser welding with scanning beam);
- Manufacturing and repair of pump drive units and marine equipment (welding in hard-to-reach places, welding-in of thin-walled shell into solid hull structures)

Main advantages:

- Welding-in of tubes of any cross-section into tube plate;
- High speed and productivity of welding;
- Welding of high-alloyed steel and copper alloys;
- High positioning accuracy;
- High reliability and low operational costs.

ROBOTIZED COMPLEX FOR LASER BUILDING-UP WELDING AND REPAIR OF MARINE ENGINEERING ARTICLES

Repair of marine engineering articles and manufacturing of articles with specific surface properties

Main advantages:

- Ability to process large scale articles
- Controlled minor weld penetration with ability to make thin build-up layers (up to 0.2 mm);
- High adherence to the substrate;
- Minimization of heat-affected zone: residual welding deformations and stresses almost nonexistent;
- Ability to process hard-to-reach surfaces and to perform local treatment;
- Minimal blending of building-up and main material

MANDREL PIPE BENDING MACHINES

Pipe bending machine STG-100RD

Pipe bending machine STG-159A





Diameter of bended pipe: Min – 38 mm Max (steel / nonferrous metals) – 89/110 mm Max bending degree – 190 degrees Electric motor power – 11 kW Dimensions (LxBxH) – 5500x1400x1500 mm Machine weight, not more than – 4 000 kg Diameter of bended pipe : Min – 75 mm Max – 160 mm Max bending degree – 180 degrees Max pipe length – 4000 mm Dimensions (LxBxH) – 8000x3000x2050 mm Machine weight, not more than – 14 000 kg

MANDREL PIPE BENDING MACHINES



Pipe bending machine STM1-2 for bending pipes dia. 14 to 60 mm



Diameter of bended pipe:

Min – 22 mm Max – 60 mm Max bending degree – 180 degrees Max pipe length – 4 000 mm Dimensions (LxBxH) – 5500x1250x1250 mm Machine weight, not more than – 2 500 kg Diameter of bended pipe: Min – 16 mm Max – 60 mm Max bending degree – 180 degrees Max pipe length – 4 200 mm Machine weight, not more than – 4 500 kg

PIPE BENDING MACHINE УТГ-ИН-377 WITH HFC HEATING

This machine is intended for bending pipes from carbon and corrosion-resistance steel and titanium alloys by heating up the pipe in narrow ring by electromagnetic field of inducer and simultaneous application of longitudinal force onto the pipe.

Diameter of bended pipe, mm

- Min **56**
- Max for steel type Steel 20 377
- Max for steel type 12X18H10T 159
- Max for Ti alloys 273

Max thickness of pipe wall

- For pipes dia. 273 mm 20
- For pipes dia. 377 mm 11
- For corrosion resistant steel pipes 7
- For Ti alloys pipes 12



Max bending radius, mm – 980 Max bending degree, degrees – 190 Max pipe length, mm – 6 000 Dimensions (LxBxH), mm – 9700x2846x1580 Machine weight, not more than, kg – 10 525

PUMPS WITH PNEUMATIC DRIVE PN-300M, PN-1000M

These pumps are intended for strength and leak tests of reservoirs, pipelines and fittings under max. pressure 30 MPa (PN-300M) and 100 MPa (PN-1000M).

	PN-300M	PN-1000M	
Maximum pressure, MPA, kgf/cm ²	30 (300)	100 (1000)	
Minimum pump displacement,			
l/min,			
- filling up	3.0	1.0	
- under max. pressure	0.8	0.25	
Air pressure in inlet pipeline,		0 F (F)	
MPa (kgf/cm ²)	0.5 (5)	0.5 (5)	
Maximum air consumption,	0.16	0.35	
m ³ /min	0.10	0.55	
Working fluid	Water, mineral oil		
Minimum boosting under	200	200	
suction, mm w.g.	300	300	
Dimensions, mm	480x390x425	480x390x425	
Weight, kg	29	43	



TECHNOLOGY AND SET OF AUTOMATED EQUIPMENT FOR PRODUCTION OF PROTECTIVE UNIT OF NUCLEAR-POWERED ICE-BREAKERS AND FLOATING NUCLEAR POWER PLANTS

This equipment is intended for welding of protective units made of austenitic steels, grade 08X18H10T, max. thickness 50 mm in lower, horizontal and vertical position ensuring welding quality and weld reinforcement deburring on dedicated position.

Technical (economic, ecological) effect:

- reduction of labor constant of welding-assembly facilities by 25-35%;
- reduction of unit price by 30-40%;
- acquisition of higher quality weld connections due to stability of automated process;
- ensuring environmental safety of production facilities;
- reduction of labor input for VR-arrangement of protective units by up to 30%;
- increase of production capacity by at least 1,2 times.

Pilot sample of automated welding equipment for production of protective units has been forwarded to experimental-industrial exploitation at JSC "Baltic shipyard"



Design of equipment system





Robotized welding station

Station for robotized removal of weld seams reinforcement



Fragment of virtual arrangement of protective units

TECHNOLOGY AND EQUIPMENT FOR SHOT-BLAST CLEANING



Metel-50 shot collection and regeneration device

Vihr-2M shot-blasting machine, with closed shot blast

Buran-5M and Buran-6M shot-blasting machines for dustless abrasive cleaning



STATIONARY CHAMBERS FOR HULL STRUCTURES CLEANING AND PAINTING





- Shifting up to 65% of painting works to preberthing stage.
- Acquisition of required cleanliness rate and optimal surface roughness for application of modern paint materials
- Full structure processing cycle at special site to exclude backward motion of articles being processed
- Usage of regenerated steel shots to ensure production environmental safety
- Relocation of processing equipment beyond chambers
- Brigades specialization

Cleaning capacity, m ² /h	from 15 to 30
Painting capacity, m ² /h	from 40 to 90
Coatings drying temperature, °C	from 20 to 35

SET OF EQUIPMENT FOR HULL STRUCTURES CLEANING AND PAINTING CHAMBERS





2 sets of equipment were delivered to JSC PA Sevmash

STAND FOR TESTING AND WATER FLUSHING OF COOLING SYSTEMS Q400



Intended for mechanical installation facilities of shipbuilding and ship repair yards to flush cooling systems with water. Can be operated both inside a shop or in the open air.

- Flow rate 450 m³/hour
- Testing / flushing pressure up to 9,5 MPa/1,2 MPa
- Filtering rate 50 to 200 μm
- Capacity of ion-exchanging filters 14 m³/hour
- Overall dimensions (L×B×H) 7000×3240×3900 mm
- Power rating 510 kW





PORTABLE STAND FOR TESTING AND FLUSHING OF HYDRAULIC SYSTEMS Q48



Intended for mechanical installation facilities of shipbuilding and ship repair yards to test and flush hydraulic systems onboard ships of all types, classes and purposes.

- Flow rate at flushing up to 48 m³/hour
- Test pressure up to 22,5 MPa
- Filtering rate up to 5 µm
- Overall dimensions (L×B×H) 6990×2490×3990 mm
- Max. power 400 kW



DEVICE FOR MOUNTING LOWER PORTION OF PROPELLER NOZZLES

The device is intended for moving the nozzle under the ship hull, alignment against the datum position, vertical shifting and final installation to the required position. The device is equipped with automated control system, monitoring moving and alignment of propeller nozzle.



- Max. lifting capacity 200 t
- Max. inclination of building berth 4 degrees
- Max. travel 1600 mm
- Overall dimensions (L×B×H) 4950×6120×4800 mm





SYSTEM FOR AUTOMATED ALIGNMENT OF ONBOARD POWER PLANTS MACHINERY



The system is intended for installation and alignment of onboard machinery by loads to stand supports.

- Number of jacks-dynamometers, combine into the system up to 20
- Weight of aligned equipment from 4 to 25 t
- Dimensions of jack-dynamometer (L×B×H) 290×180×430 mm







COMPOSITE SHIPBUILDING TECHNOLOGIES

TECNHOLOGY OF MECHANIZED WINDING OF COMPOSITE STRUCTURES

This is automated procedure in course of which the continuously strengthened fiber (preliminary resin impregnated or passing through resign bath) winds under regulated tension around the rotating form to make up the composite structure.



Applied reinforcement materials – glass fiber, carbon fiber, aramide fiber, basalt fiber.

Application of organic plastic of 1.35 g/cm³ density instead of glass fiber (2.0 g/cm³) decreases hull weight by 20-30% at similar mechanical parameters.

Composite cylinders are stronger than steel ones, immune to corrosion and resistant against aggressive environment



FRICTION MATERIALS



Antifriction material SFERA-40T



Antifriction material *SFERA-40 TD* for sealing of ball shutoff valves of friction assemblies

comparative specifications of inction assembly materials			
	Марка материала		
Physical and mechanical	ΔΛΙΙΤΑ ΔΟ		

Comparative encolfications of friction accomply materials

Physical and mechanical – properties	Марка материала			
	SFERA-40T	SFERA-40 TD	ANITA-40 (current)	
Static pressure strength, MPa	102.1	104.5	71.8	
Static bending strength, MPa	92.3	85.7	53.6	
Impact viscosity, kJ/m ²	22.0	24.9	16.9	
Ultimate tensile strength, MPa	51.0	46.1	32.5	
Density, g/cm ³	1.551	1.662	1.889	
Hardness, MPa	147	150	105.4	
Friction factor of sliding bearing	0.13	0.16	0.17	

SPECIAL COATINGS APPLICATION PROCEDURE



Development of technologies for application and sealing of special-purpose hydro-acoustic coatings, designing shops for special coating and equipment



Rendering works to extend service life of special coatings on ships being repaired or modernized

VIBROACOUSTIC PROTECTION OF SHIP COMPARTMENTS





- Calculating levels of noise and vibration affecting humans in compartments of ships and vessels at the stage of design, HATs, SATs, and DATs.
- Calculating noise levels at work places and production rooms upon construction of capital structures.
- Comprehensive trials of structures, materials and aids used for vibro-acoustic protection using experimental capabilities of the institute



APPLICATION OF INFORMATION TECHNOLOGIES IN SHIPBUILDING

APPLICATION OF INFORMATION TECHNOLOGIES IN SHIPBUILDING



- Integrated logistics support for shipbuilding products
- Complex automation of shipbuilding enterprises
- Technologies for 3D virtual propotyping of articles, facilities and systems
- Production data support by means of CAD / CAM / CAPP / PLM software
- Data support for complex implementation of shipbuilding technologies and technological equipment
- Complex modeling and analysis of production and technological system, justification of principal technologies selection
- Engineering analysis and ergonomics calculation
- Computer-aided design of articles, facilities and structures







APPLICATION OF 3D MODELING AND ANIMATION

Electronic 3D-models for JSC "Admiralty Yards" (Saint-Petersburg and production site at Kotlin island)

Programming environment: CATIA, 3D StudioMax, Cinema 4D

Electronic 3D-models for JSC "Northern Shipyard" and LLC "Baltic shipyard", Saint-Petersburg

Programming environment: Rhinoceros, 3DStudioMax





Electronic 3D model of JSC FES "Zvezda", Bolshoy Kamen

Programming environment: 3DStudioMax, Cinema 4D, Rhinoceros

Electronic 3D-model of JSC "Shipyard "Yantar", Kalinigrad

Programming environment: 3DStudioMax, Cinema 4D, Rhinoceros







APPLICATION OF 3D MODELING AND ANIMATION

Modeling of vessels, ships and marine equipment



Programming environment: CATIA, SolidWorks, Unigraphics Solution, Creo (Pro/E), 3DStudioMax



Programming environment: CATIA, Rhinoceros, SolidWorks, Unigraphics Solution



Programming environment: CATIA, Rhinoceros, Cinema 4D, SolidWorks, Unigraphics Solution, Creo (Pro/E)

APPLICATION OF 3D-MODELING AND ERGONOMICS ANALYSIS





- Analysis of technology for dismantling of complex equipment in ship's compartments by using 3D-modeling and personnel's electronic dummies
- Analysis of scheduled maintenance availability by using 3Dmodel of the shop and personnel's electronic dummies
- Analysis of technology for mounting/dismantling of equipment in ship's compartments by using 3D-modeling and personnel's electronic dummies
- Analysis of control elements layout of deep-operating vehicle by using 3D-modeling and personnel's electronic dummies





Programming and analysis environment: Rhinoceros, Jack (UGS) , Human (DELMIA)

SIMULATION MODELING OF PRODUCTION PROCEDURES



Programming environment AnyLogic Professional

SIMULATION MODELING OF PRODUCTION PROCEDURES

Hull plating and welding-assembly facility of JSC "Northern Shipyard" (Shop No.4 and No.7)



 When applying 20 t program and two-shift operation, flat section/micropanel assembly and welding line is fully loaded

Production of straight-tube steam generators at JSC DB Afrikantov

Model's intended use:

- Analysis of load of production equipment and sites
- Calculation of site capacity and duration of annual program execution considering welding flaws
- Making up solution for effective estimation of optimal operation parameters for the site and equipment

Modeling results:

- Load statistics for production equipment
- Statistics on parts and assemblies manufacturing
- Number of shifts spent to manufacture parts and assemblies

SIMULATION MODELING IN FISHING VESSELS DESIGN

Fish-processing complex at medium fishing decked trawler





Initial data:

- Statistics on fishing vessel projects
- Branch regulatory documents
- Project data on shop being modeled
- Technological equipment documentation

Parameters adjusted in course of testing:

- Amount of raw material coming for processing
- Operation modes of production equipment
- Personnel number
- Number of duration of working shifts

Modeling results:

- Number of servicing personnel has been reduced
- Bottlenecks of production system have been revealed

Programming environment GPSS World



VIRTUAL RESEARCH CENTER

Composition of virtual prototyping complex (VPC)



- 4-screen 3D-visualization projection system
- Image generation system (graphic system)
- Tracking and interactive communication system, including:
 - VR-suit
 - Tactile feedback system
 - Spatial manipulator
 - Active 3D-glasses

VPC functioning mode

Operation with virtual image of 3D model

Operation with adjustment of initial 3D model



Supported are 3D-models developed in: CATIA/DELMIA, Foran, AVEVA Marine, SolidWorks, Creo (Pro/E), Autodesk Inventor, Compas 3D, Rhinoceros, 3DsMax, ...

VIRTUAL RESEARCH CENTER







Design of articles, facilities, buildings and structures

- Securing conduction of action meetings regarding finalization of design solutions
- Design and analysis of configuration solutions, including production sites and working areas
- Preparing illustrations for project report documentation
- Representing work results for the Customer
- Designing complex equipment
- Securing conduction of action meetings regarding finalization of design solutions
- Analyzing configuration of separate equipment assemblies
- Analysis of equipment assemblability using tactile feedback system
- Checking equipment layout at production sites
- Preparing illustrations for project report documentation
- Preparing engineering staff for equipment assembly and maintenance
- Representing the project for the Customer





DESIGNING OF FISHING, RESEARCH AND OTHER TYPES OF VESSELS

DESIGNING OF FISHING, FISH-PROCESSING AND RESEARCH VESSELS



Development of detail designs and working documentation for construction and repair of vessels

The company has developed designs for more than 800 various seagoing ship: large, medium and small fishing vessels, series of research vessels for versatile geological and geophysical researches of Russian and worldwide continental shelves



LARGE FISHING FREEZER TRAWLER, project BMRT80 VOSTOK

- fishing by bottom and pelagic trawls;
- processing of fish into frozen dressed and undressed products, processing of inedible bycatch, off-grade raw material and production waste into fish meal and fish oil;
- storage of processed products and their transportation to ports, or delivery of processed products to fish-carrier refrigerator vessels at sea.
- LOA x Breadth x Depth, m 73.9 x 15.6 x 11.2
- Capacity of frozen products' hold, m³ 2200
- Speed 13 knots
- Power of main propulsion engine 4500 kW



MEDIUM FISHING TRAWLER-FREEZER, project SRTM58 Azimut

- fishing by bottom and pelagic trawls;
- processing of fish into frozen dressed and undressed products, processing of inedible bycatch, off-grade raw material and production waste into fish meal and fish oil;
- storage of processed products and their transportation to ports, or delivery of processed products to fish-carrier refrigerator vessels at sea.
- LOA x Breadth x Depth, m 58.9 x 12.5 x 8.0
- Capacity of frozen products' hold, m³ 690

- Speed 13 knots
- Power of main propulsion engine 2740 kW



MEDIUM CRABBER FREEZER VESSEL, project SKS56 Komandor

- crabbing by conical pots;
- primary processing, sorting, dressing, and freezing of the catch;
- transfer of products to transportation vessels or delivery to ports.
- LOA x Breadth x Depth, m 56.2 x 11.2 x 8.6/9.2
- Capacity of freezer hold, m³ 840

- Speed 14 knots
 - Power of main propulsion engine 1600 kW



MEDIUM FISHING TRAWLER-FREEZER, project SRTM38 Gorizont

- fishing by trawls of various depth;
- dressing and freezing of the catch;
- transportation of frozen products.
- LOA x Breadth x Depth, m 39.5 x 9.0 x 6.9
- Capacity of freezer hold, m³ 380

- Speed 12 knots
- Power of main propulsion engine 1326 kW



MEDIUM FISHING REFRIGERATOR TRAWLER, project 23490 (SRTR38M) Merkuriy

- fishing by trawls of various depth;
- dressing and freezing of the catch;
- liver freezing;
- transportation of frozen products.
- LOA x Breadth x Depth, m 38.4 x 9.0 x 6.9
- Capacity of freezer hold, m³ 285.5

- Speed 12.5 knots
- Power of main propulsion engine 1326 kW



MEDIUM FISHING TRAWLER-SEINER, project SRTS38 Orion

- fishing by trawls of various depth;
- fishing by purse seine;
- primary processing of the catch;
- storage and transportation of the catch in containers (boxes) in the refrigerator hold or in bulk in refrigerated condition.
- LOA x Breadth x Depth, m 38.5 x 10.0 x 6.9
- Capacity of cargo hold, m³ 395

- Speed, knots 12
- Propulsion plant power, kW 1290



MEDIUM FISHING REFRIGERATOR TRAWLER, project 03280 (SRTR38) Meridian-R

- fishing by trawls of various depth;
- primary processing of the catch;
- transportation of cooled products.
- LOA x Breadth x Depth, m 38.4 x 9.0 x 6.9
- Capacity of freezer hold, m³ 390

- Speed, knots 12
- Propulsion plant power, kW 1200


MEDIUM FISHING TRAWLER-FREEZER, project 03281 (SRTM38) Meridian-M

Application

- fishing by trawls of various depth;
- primary processing of the catch;
- transportation of frozen products.
- LOA x Breadth x Depth, m 38.4 x 9.4 x 6.9
- Capacity of freezer hold, m³ 380

- Speed, knots 12
- Propulsion plant power, kW 1200



SMALL FISHING TRAWLER-SEINER, project MRTS28 Vizir

Application

- fishing by bottom trawls;
- fishing by pelagic trawls;
- fishing by purse seine;
- cooling of the catch;
- transportation of chilled or frozen products in the hold or transportation of chilled products in RSW or DC tanks depending on vessel modification.
- LOA x Breadth x Depth, m 28.0 x 9.0 x 6.4
- Capacity of refrigerator hold, m³ 190

- Speed, knots 11
- Propulsion plant power, kW 1007



SMALL OIL SPILL RECOVERY VESSEL

Application

- Collection of emergency oil and oil products spillages with flash point <60°C;
- Collection of oil-containing water from ships, settling, separation with pumping oil products to oil residue tank, delivery of oil products to oil tankage and separated clean water onshore, or outboard in permitted areas;
- Collection of waste water and garbage from ships and delivery to on-shore treatment facilities;
- Rescue of crew from ships and oil rigs in distress, fire extinguishing.



- LOA x Breadth x Depth, m 44.5 x 10.0 x 3.2
- Cargo hold capacity, m³– 699
- Speed, knots 11.0
- Crew, men 8
- Operation area ports of the Russian Federation, oil and gas deposits within the restricted area R2

BILGE / GREY WATER, MUD, AND GARBAGE COLLECTING VESSEL

Application

Collecting oily waters, mud, grey waters, and garbage from ships, transportation and discharge to a shore facility

2 vessels were build:

- at JSC "Vyborg Shipyard" in 2002 (for Primorsk port, Leningrad Region)
- at FEP "Zvezda" in 2005 (for Vostochny port)

Cargo tank capacity (m³):

- Grey water 164.0
- Oily water 169.0
- Mud 141.0







DEVELOPMENT, PRODUCTION AND TESTING OF SHIPBORNE PIPELINE VALVES AND FITTINGS

DESIGN BUREAU "ARMAS"



Design bureau "Armas" in main developer of shipboard pipe fittings for Russian Navy, civil shipbuilding and military-technical cooperation.

From the date of establishment (1939) the design bureau developed and implemented more than 20 000 types of shipboard pipe fittings.

Design documentation archive amounts to several hundred thousand drawings. This documentation is used by all enterprises focusing on design, construction and repair of marine equipment, including surface ships, submarines, and offshore rigs.



MAIN R&D ACTIVITIES OF DB "ARMAS

External fittings for modern deep-operating vehicles

Pressure release fittings upon emergency (fire)

Shipboard ventilation fittings









FITTING MANUFACTURING FACILITY OF DB "ARMAS"



Processing system HELLER H 1000



HERMLE C30U

Significant retooling of machining shop was conducted within several last years: 47 modern multifunctional CNC-machines were put into operation, being capable to process items of any shape and complexity.



Two-rack turning lathe SKD 25D



www.sstc.spb.ru

UNIQUE STAND COMPLEX OF DB "ARMAS"





Unique stand complex of DB "Armas" certified by "Oboronsertifica" system is capable to test all types of pipe fittings.

- Leakage and performance test stands (HP air, water, воздух высокого давления, вода, hydraulic fluid);
- Vibroacoustic and consumption test stand (medium pressure air, water, hydraulic fluid);
- Shock and vibration test stands;
- Environmental test stands (temperature, humidity).







FOREIGN ECONOMIC ACTIVITIES



FOREIGN ECONOMIC ACTIVITIES

Development, modernization and re-equipment of shipbuilding enterprises and hydraulic engineering facilities for shipbuilding

Setting-up on shore infrastructure for stationing of ships



Rendering technical assistance in construction of ships and vessels, delivery of design documentation, delivery and installation of shipboard equipment and systems, conduction of trials







Training of foreign specialists



Procurement and technical assistance in equipment installation

www.sstc.spb.ru

shipbuilding

principal technologies for

SHIP REPAIR YARD (VIETNAM)



2012 – up to date: New ship repair plant construction

SHIPYARD AT ORINOCO RIVER (VENEZUELA)



2011 – up to date: New shipyard construction

MAJOR FOREIGN POJECTS

Algeria	1980 – 1991	Shipbuilding workshops, Mers-el-Kebir			
Bulgaria	1978 – 1979	Dry dock, Varna			
China	2000 – 2006	Shore stationing facilities for surface ships and submarines			
	1955 – 1962	Shipyard, Khulu Dao			
Egypt	1958 – 1969	Shipyard, Alexandria			
Greece	2000 – 2002	Shore stationing facilities for ZUBR type hovercraft			
Guinea	1966 – 1968	Shipyard, Conakry			
Hungary	1976 – 1979	Ship and crane building yard, Budapest			
India	2010 – date	e Rendering technical assistance in construction type 71 ship, Cochin			
	2001 – date	Shiprepair yards, Mumbai and Karwar, for type 11430 ships			
	1997 – date	Shiprepair yards for type 11356 ships and armament repair facilities for type 877EKM and			
		type 17 ships, Mumbai and Visakhapatnam			
	1992 – date	Shipyards, Visakhapatnam			
Iran	1997 – 2008	Ship repair yard, Bandar Abbas			
Libya	1975 – 1982	Shiprepair workshops and shore stationing facilities			
Nicaragua	1992 – 1993	Geothermal power plant, San Jasinto			
Romania	1971 – 1975	Shipbuilding dry dock, shiprepair dry dock, Constantsa			
Ukraine	1965 – 1967	<i>Okean</i> Shipyard, Nikolayev (dry dock)			
	1960 – 1995	Chernomorskiy shipyard, Nikolayev			
Venezuela	2011 – date	Shipbuilding and shiprepair yard, Orinoco river			
Vietnam	2012 – date	Shiprepair yard X-52, Kamran			
	2009 – date	Naval base, Kamran			
	1993	Fishing vessel building and repair yard for "Sayership", Ho Chi Min			
	1989 – 1990	Shiprepair yard Bashon			
	1989	Shipyard Bag Dong, Haiphong; Mechanical works No.2, Ho Chi Min			

EDUCATION RESEARCH CENTER

The main goal for ERC establishment is integration and coordination of training, scientific and innovative potential of JSC SSTC divisions for further joint actions in education and research areas, including international activities.



EDUCATION RESEARCH CENTER

Since the establishment, the ERC trained more than 1080 specialists on 59 specializations for navy, shipyards and dockyards of foreign countries

Year	Foreign customer	Pers.	Specialization
2006	Iranian Navy	37	Specialists on submarines repair and maintenance
2007	Indian Navy	4	Specialists on submarines repair and maintenance
2008	Indian Navy	175	Specialists on surface ships repair and maintenance
2009	Indian Navy	65	Specialists on surface ships repair and maintenance
2010	Indian Navy	95	Specialists on surface ships repair and maintenance
2011	Indian Navy	216	Surface ship's crew
2012	Indian Navy	175	Surface ship's crew
2013	Vietnam Navy	37	Specialists on submarines repair and maintenance
2013	Indian Navy	33	Specialists on submarines repair and maintenance
2013	Polish Navy	6	Specialists on submarines repair and maintenance

EDUCATION RESEARCH CENTER

Year	Foreign customer	Pers.	Specialization
2014	Indian Navy	8	Specialists on surface ships and submarines repair and maintenance
2014	Polish Navy	6	Specialists on submarines repair and maintenance
2016	Algerian Navy	36	Specialists on submarines repair and maintenance
2017	Vietnam Navy	7	Specialists on submarines repair and maintenance
2017 – 2018	Indian Navy	47	Specialists on surface ships repair and maintenance
2018	Indian Navy	25	Specialists on submarines repair and maintenance
2019	Indian Navy	89	Specialists on surface ships repair and maintenance
2020	Indian Navy	26	Specialists of Goa Shipyard Limited on construction of ships P-11356 (distance education)
2021	Indian Navy	24	Specialists of Goa Shipyard Limited on construction of ships P-11356 (distance education)

As well as more than 160 specialists from Russian shipbuilding and ship repair yards.

FOREIGN ECONOMIC COOPERATION





7, Promyshlennaya Street, St. Petersburg, 198095, Russia Tel.: +7 (812) 786-26-10, Fax: +7 (812) 786-04-59 www.sstc.spb.ru, e-mail: inbox@sstc.spb.ru