



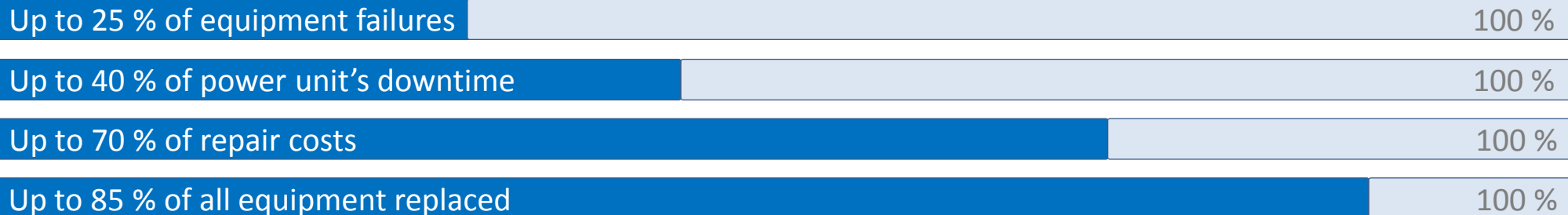
WAYS TO ASSURE SAFETY OF PIPELINE VALVES FOR NPP

ASSURING SAFETY IS ONE OF THE MOST IMPORTANT TASKS AT NPP

There are more than 16 000 valves at a typical power unit.
Reliability of these valves **is crucial** for NPP's safety:

More than **80%** are highly responsible stop valves and stop-and-control valves;
Around **35%** are valves with electric actuators. Besides, valves with electric actuators influence reliability and safety of NPP most of all.

Related to NPP valves:



Safety is assured at all stages of product's lifecycle:



Currently, we dedicate special attention to prolongation of valves' service life in relation to expiration of power unit's specified service life

CKBA performs complex works on prolongation of specified service life for valves of the 2nd, 3rd and 4th safety class

CKBA performs design supervision and works on service life prolongation at all the 10 Russian NPPs, as well as at European NPPs, for example Kozloduy NPP (Bulgaria).

In 2011-2015 only, CKBA performed inspection and issued expert conclusions to prolong service life for more than 30 000 valves.



As part of the works on valve inspection and service life prolongation, CKBA also recovers passports for valves in operation.

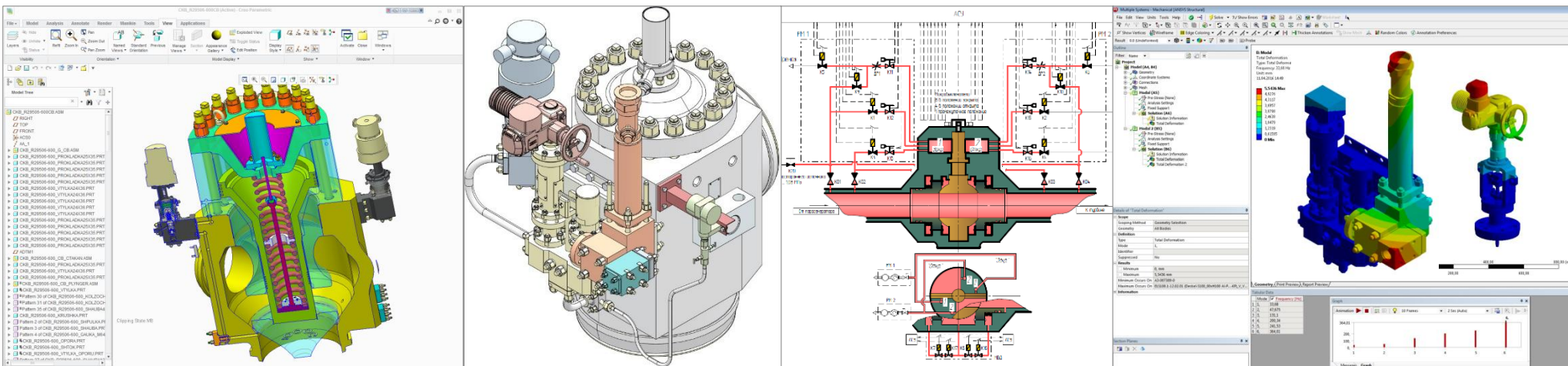
For example, in 2015-2016 at the Kozloduy NPP, we performed passportization works for 400 different valves: wedge gate valves, globe valves, check valves, control valves, ventilation butterfly valves, safety valves, of the 2nd, 3rd, 4th safety class.

Volume of passportization works at the Kozloduy NPP in 2015-2016

Safety class	Quantity of valves	Quantity of issued passports
2	347	<ul style="list-style-type: none"> ✓ 29 group passports for 159 valves ✓ 188 individual passports
3	44	<ul style="list-style-type: none"> ✓ 8 group passports for 33 valves ✓ 11 individual passports
4	9	<ul style="list-style-type: none"> ✓ 3 group passports

SAFETY IN DESIGN is assured with:

- ✓ Product's conformance to parameters intended use, design requirements, customer's requirements;
- ✓ Application of design solutions proven in practice or by testing;
- ✓ Proper choice of components' materials;
- ✓ Proof by design calculations;
- ✓ Development of operational documentation and other technical documentation for all stages of product's lifecycle.



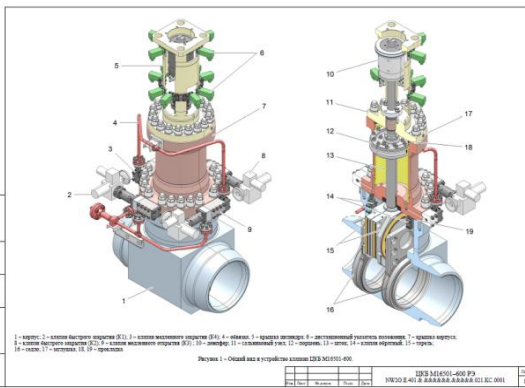
SAFETY IN MANUFACTURE is assured with:

- ✓ Control of all technological processes that influence safety;
- ✓ System of manufacturing control and testing for conformance to reliability and safety requirements of design documentation;
- ✓ Clear and permanent identification marking on valves in accordance with design documentation;
- ✓ Delivery of valves with passports, operation manuals and, if required, repair manuals.



SAFETY IN OPERATION is assured with:

- ✓ Using valves for intended application within the service life and resource specified in the passport and operation manual;
- ✓ Obligatory recording service life data
- ✓ Suspending operation of a valve upon expiry of specified service life or exceeding resource, to perform works on service life prolongation;
- ✓ Maintenance, repair, diagnostics, periodic inspections, safety evaluations, control of technical condition.



The works on service life prolongation include:

- ✓ Analysis of the list of valves for inspection;
- ✓ Analysis of normative, design, operational and repair documentation;
- ✓ Analysis of conditions and history of operation;
- ✓ Development of the inspection program (specifying methods and scope of control);
- ✓ Performing the inspection.



ANALYSIS OF CONDITIONS AND HISTORY OF OPERATION INCLUDES getting information about actual service life, cycles, eventual failures, repairs, previous inspection and testing results, damaging factors and aging characteristics.

INSPECTION includes the following works

- ✓ Visual and dimensional control, including wall thickness control;
- ✓ Control testing, verification of operability;
- ✓ Testing materials for defects, chemical composition, mechanical properties;
- ✓ Disassembling to evaluate technical conditions;
- ✓ Strength and reliability calculations;
- ✓ Preparation of the conclusion with substantiation of the prolonged resource/service life;
- ✓ Developing design solution on possibility, time and conditions of further operation, or decommissioning;
- ✓ Development of the valve resource program (procedures to assure reliability and safety) for the prolonged period, including recommended rules of technical condition control.

THE MOST TYPICAL VALVE FAILURES.

Type of failure	Percentage
Loss of leak tightness	82 %
Loss of body/trim integrity	4,0 %
Failure to open or close	3,0 %
Absence or distortion of signals from the automated control system	3,0 %
Failure of actuator	6,0 %
Destruction of a structural element	2,0 %

CKBA has accumulated a long experience in assuring reliability of all valve components.

RECOMMENDATIONS TO IMPROVE RELIABILITY AND SAFETY based on experience of inspection and service life prolongation.	
Closure unit	<ul style="list-style-type: none"> ✓ Hard-facing with hardness values $HRC \geq 40$; ✓ Improved geometry to assure the best engagement of sealing surfaces; ✓ Minimal roughness of sealing surfaces; ✓ Using modern processes of surface strengthening.
Trim	<ul style="list-style-type: none"> ✓ Ultrasonic control of trim components materials; ✓ Using gaskets of modern materials, for example expanded graphite
Moving components, friction units	<ul style="list-style-type: none"> ✓ Application of frictional compounds on friction components to reduce wear.
Actuators	<ul style="list-style-type: none"> ✓ Use of intelligent actuators with moving units diagnostics
Structural elements	<ul style="list-style-type: none"> ✓ Increasing life and dependability of multi-layer bellows, the most important structural element of bellows sealed valves.

Valves manufactured in The Czech Republic (former CzSSR):

The Czech company "Sygma" used to supply to USSR, and nowadays supplies to Russia, gate valves, check valves, globe valves, control valves for nuclear power plants:

Balakovo NPP, Bilibino NPP, Kalinin NPP, Kursk NPP, Leningrad NPP,
Rostov NPP, Smolensk NPP.

JSC "NPF "CKBA" performed safety inspection and works on service life prolongation of:

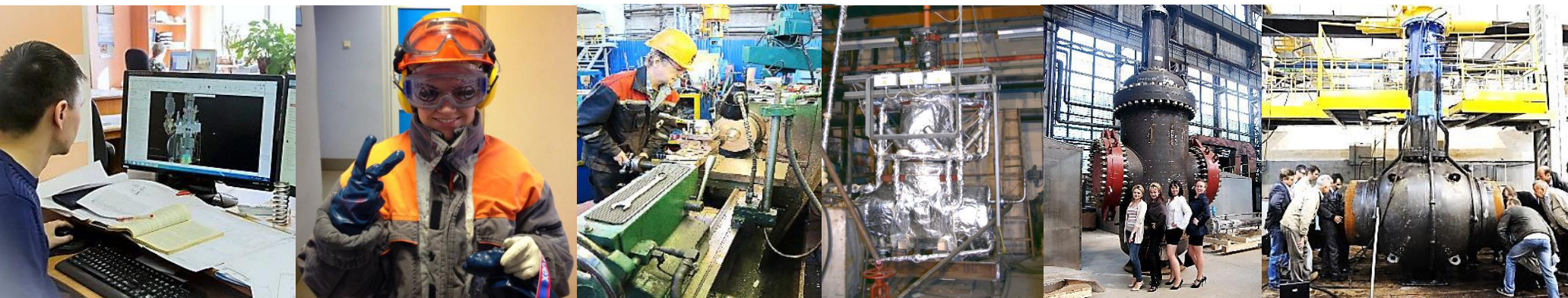
- ✓ more than 1 500 gate valves;
- ✓ more than 9 000 bellows sealed valves,
- ✓ more than 500 control and check valves

To this day, actual service life of certain valves has reached more than 40 years.

Results of works on service life prolongation testify high technical characteristics, good quality and reliability of valves manufactured by Czech companies.



JSC "NPF "CKBA" today

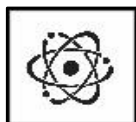


JSC "NPF "CKBA" is the engineering company performing full cycle of works, from scientific research to complete turn-key delivery of high technology products, as well as maintenance of delivered products during all stages of the lifetime cycle.



- ❖ Manufacture and complete deliveries;
- ❖ Design;
- ❖ Research and development;
- ❖ Standardization;
- ❖ Inspection and service life prolongation;
- ❖ Maintenance.

CKBA delivers projects mainly in the industries of:



Nuclear power



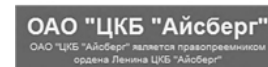
Ship building



Oil and gas transport



Chemical and refining industry



Транснефть



СУРГУТНЕФТЕГАЗ
ОТКРЫТОЕ АКЦИОНЕРНОЕ ОБЩЕСТВО



CKBA supplies a wide range of standard and tailored valves for domestic and foreign industrial companies.

Valves for different applications



- Stop valves
- Lift/swing check valves
- Safety valves
- Pilot-operated safety valves
- Control valves
- Butterfly valves
- Ball valves



Main steam valves



- Pilot-operated safety valve
- Main steam isolation valve
- Atmospheric steam discharge valve

Seawater valves



- Ball valves
- Butterfly valves
- Check valves
- Lift check valves
- Drain valves
- Safety valves
- Rubber extensions

Ventilation valves



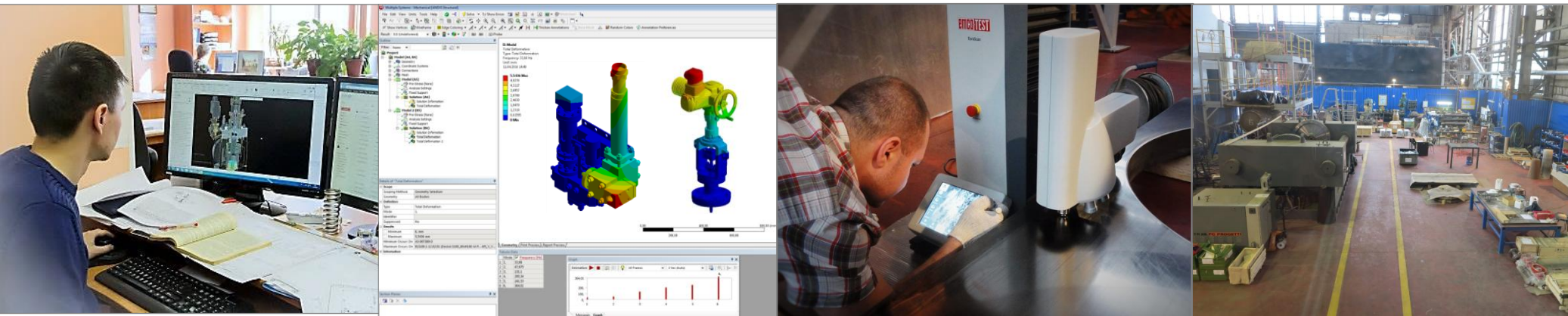
- Air-tight butterfly valves
- Stop and check valves
- Automatic safety devices

> Pipeline valves to customer's special requirements



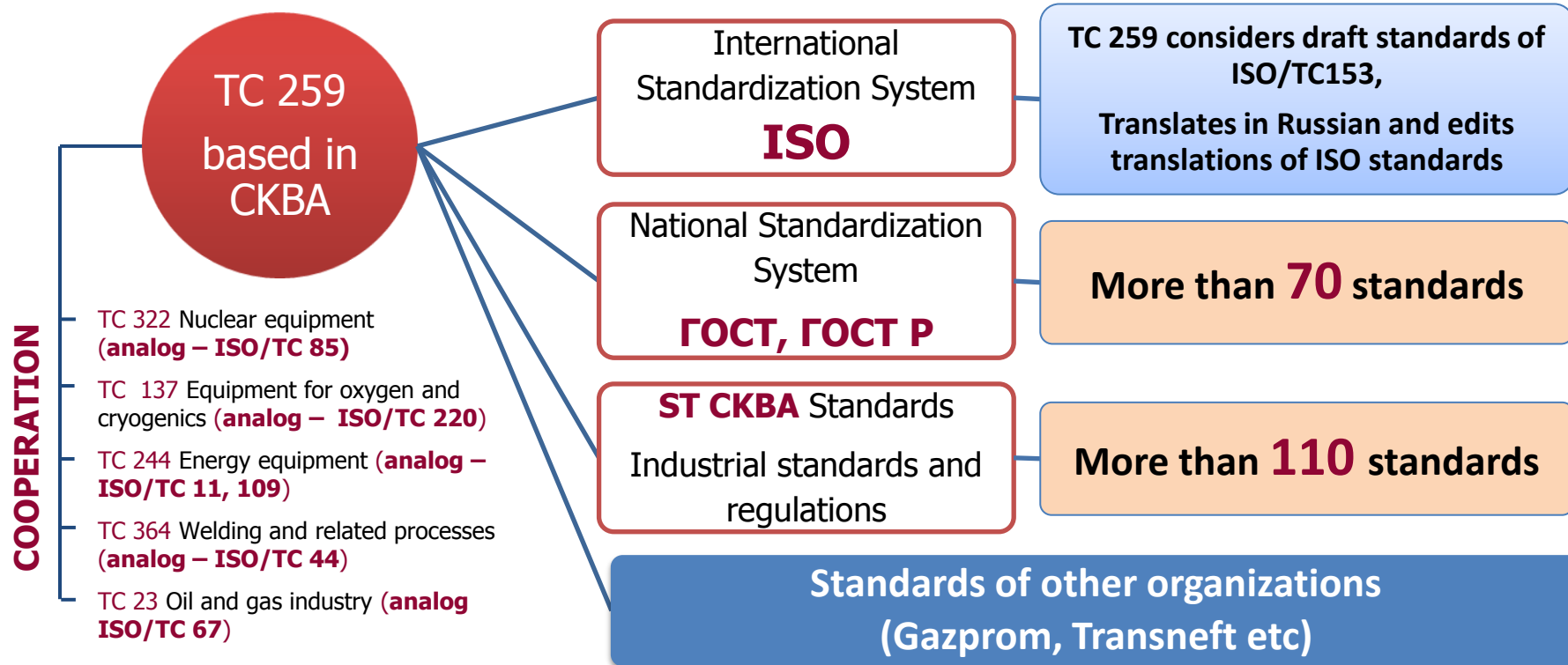
All design work of CKBA is carried out with aid of newest software and equipment that allows to launch new high technology products according to intended application and customer's special requirements.

- ❖ Development of products using 3D design tools;
- ❖ Research and development materials and technologies laboratory;
- ❖ Technical calculations;
- ❖ Test bench;
- ❖ Assembly workshop.



JSC "NPF "CKBA" is the leader in development of national and industry standards for pipeline valves and related equipment and components.

More than 300 manufacturers in Russia and CIS apply CKBA standards



CKBA has **all the necessary** licenses and certificates for provision of services and manufacture of products.

Quality management system of the company is certified and conforms to international standards. CKBA takes part on a constant basis in big governmental contracts for supply of valves and performs export deliveries. This implies **strict conformance** to quality and safety requirements.



THANK YOU FOR YOUR ATTENTION!

**Joint Stock Company "Scientific and Production Firm "Central Valve Design Bureau"
(JSC "NPF "CKBA")**

195027, Saint-Petersburg, pr. Shaumyana 4, building 1, lit. «A»

phone: (812) 611--10-00

fax: (812) 458-72-22

e--mail: info@ckba.ru

www.ckba.ru

General Director – Vladimir Pavlovich Dydychkin