

PROLOG LLC

**EXPERIENCE IN EQUIPMENT DEVELOPMENT
FOR CONTROL AND REPAIR OF RBMK-1000
AND IN RADIOACTIVE GRAPHITE HANDLING**



**PRESENTATION AT A TECHNICAL MEETING
EXPERTISE IN REACTOR DISMANTLING
VISAGINAS INPP. 25/10/2018**

About Prolog LLC

- Located in Obninsk (Russia, Kaluga region)
- Established in 1998
- Focus on design and manufacture of measuring instruments, minirobots for inspection of hard-to-reach places and special equipment for nuclear power plants
- 120 employees (engineers: 50, administration staff: 10, production staff: 40, maintenance department: 20)





About Prolog LLC

- pre-project survey of the facility;
- development of design documentation;
- manufacturing and testing of equipment prototypes;
- equipment manufacture, testing, adjustment and set-up;
- metrological support;
- development of operational and safety documentation for equipment supplied;
- assembly and adjustment of equipment at the facility;
- non-destructive testing of the facility;
- equipment maintenance and repair at the facility.

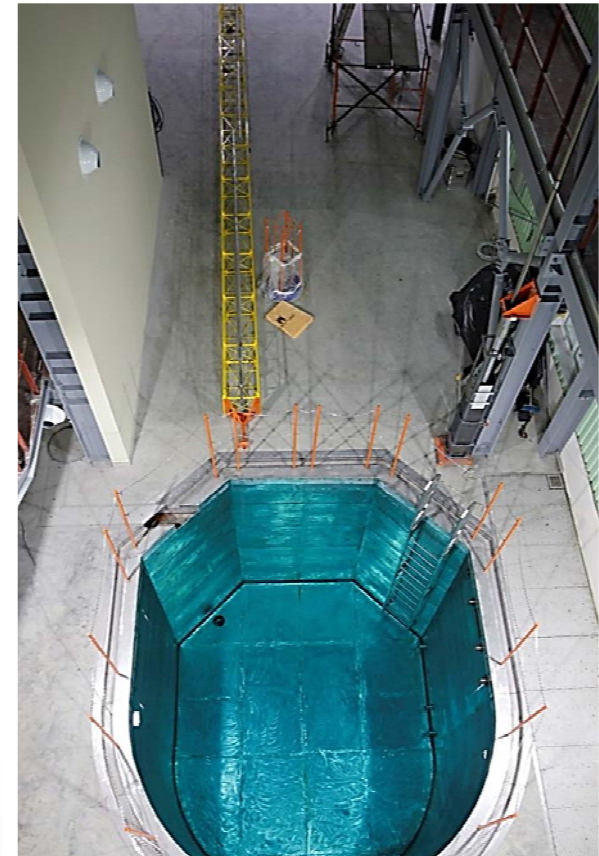
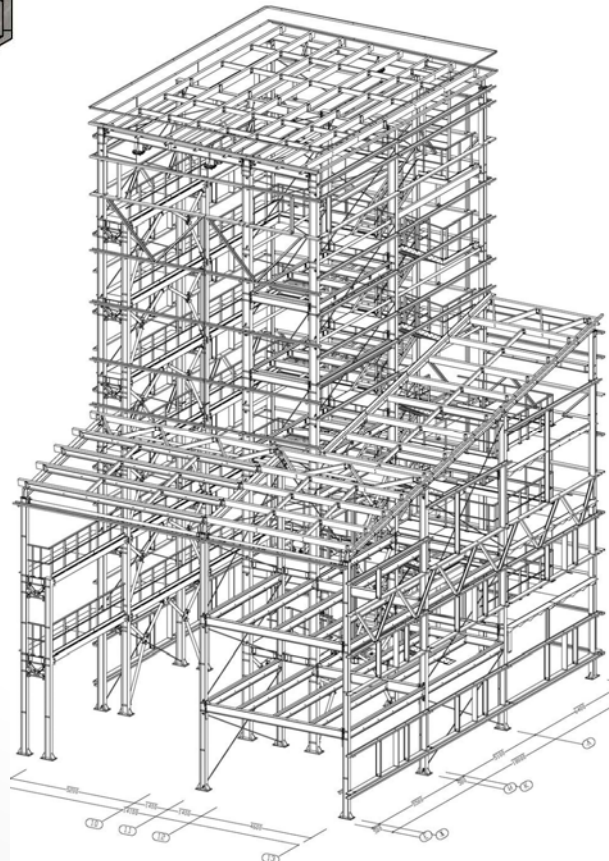
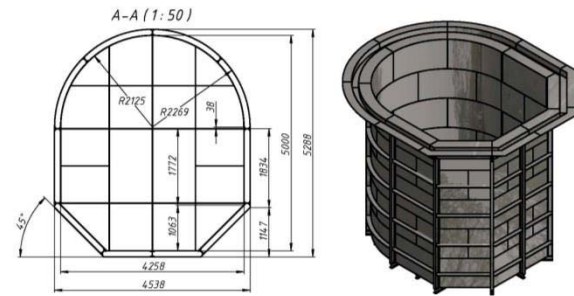
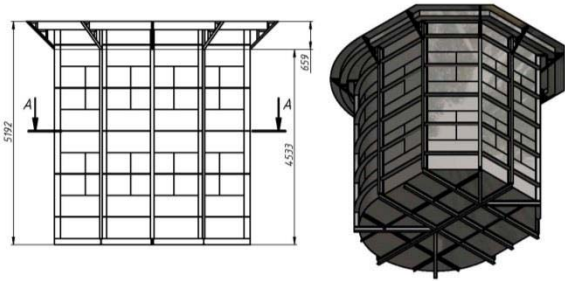
The enterprise has a metrological laboratory accredited for instrument calibration.

Prolog LLC specialists are certified for non-destructive testing: 22-VIC, 17-USC, 2-ECC, 2-LPC.

Test stands

All equipment to be constructed and manufactured passes a full cycle of tests on full-scale stands.

For testing equipment (including long-length and underwater), Prolog has its own bench-test facilities, including a universal tower with a 20 m hoisting machine, a 22 m deep mine and a 5 m deep pool.



Experience in equipment development for nuclear power plants with RBMK



Systems for measuring the geometric parameters of graphite columns have been developed and manufactured since 1999 and are applied to all nuclear power plants with RBMK-1000 and EGP-6.

The developed systems operate on different physical principles and use different methods of measurement.

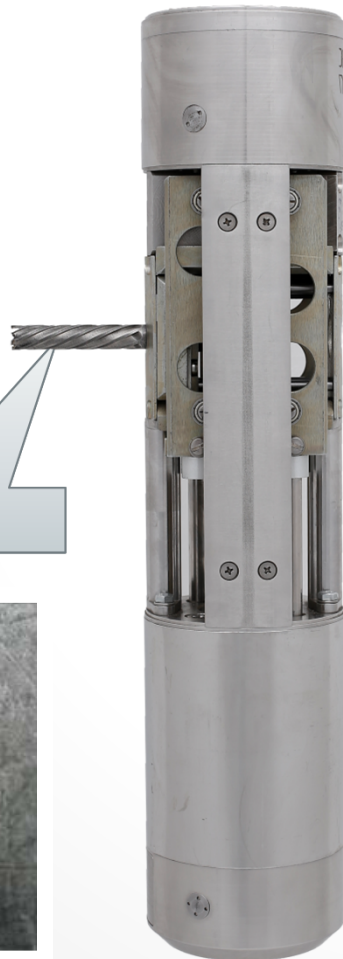
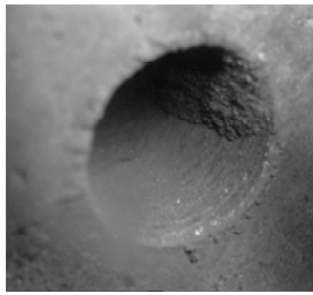


Experience in equipment development for nuclear power plants with RBMK



Tools for sampling graphite from graphite columns have been developed and manufactured since 2006, are applied at all NPPs with RBMK-1000.

Probe sampler



Tubular mill



Control unit



Sampling time: 3 min
Coring time: 40 seconds

Graphite sample



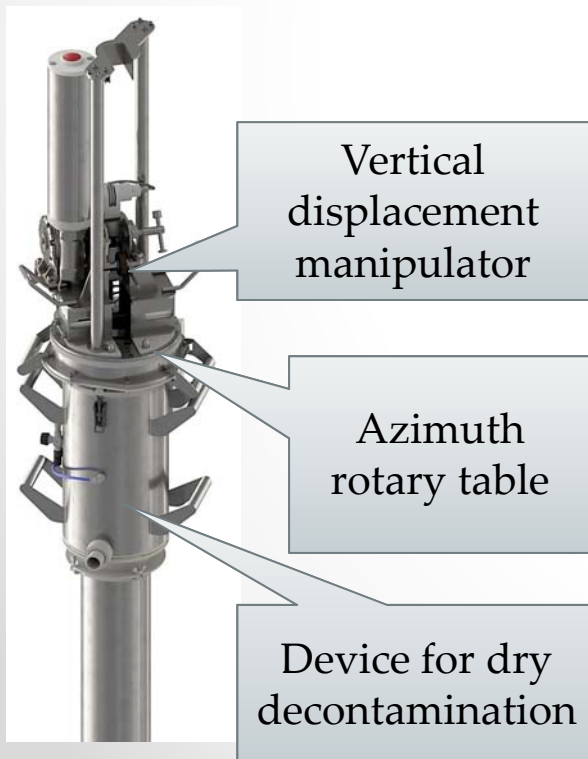
Diameter of graphite core: 10 mm
A graphite core is 37 to 68 mm long

Experience in equipment development for nuclear power plants with RBMK



A set of equipment for RRC (restoration of the resource characteristics of the graphite stack) operations, including tools for mechanical processing of graphite, collection of graphite cutting products, measuring systems, was used during 6 repairs at the 1st and 2nd power units of KuNPP since 2013.

Cutting tools



Experience in equipment development for nuclear power plants with RBMK



A system for collecting graphite cutting products and packaging them in a protective container.



In the course of RRC, about 36 tonnes of reactor graphite were crushed, extracted from the reactor space and packed into containers.



Experience in equipment development for nuclear power plants with RBMK

A robotic complex for remote cutting of the corners
of graphite columns and withdrawal of graphite fragments from the reactor core.

Working conditions:

Temperature: + up to 50 °C

Dose rate: up to 1000 r/hr

Robot dimensions: 572 x 94 x 93 mm

Weight: 7 kg

Magnetic suspension: 40 to 90 kg

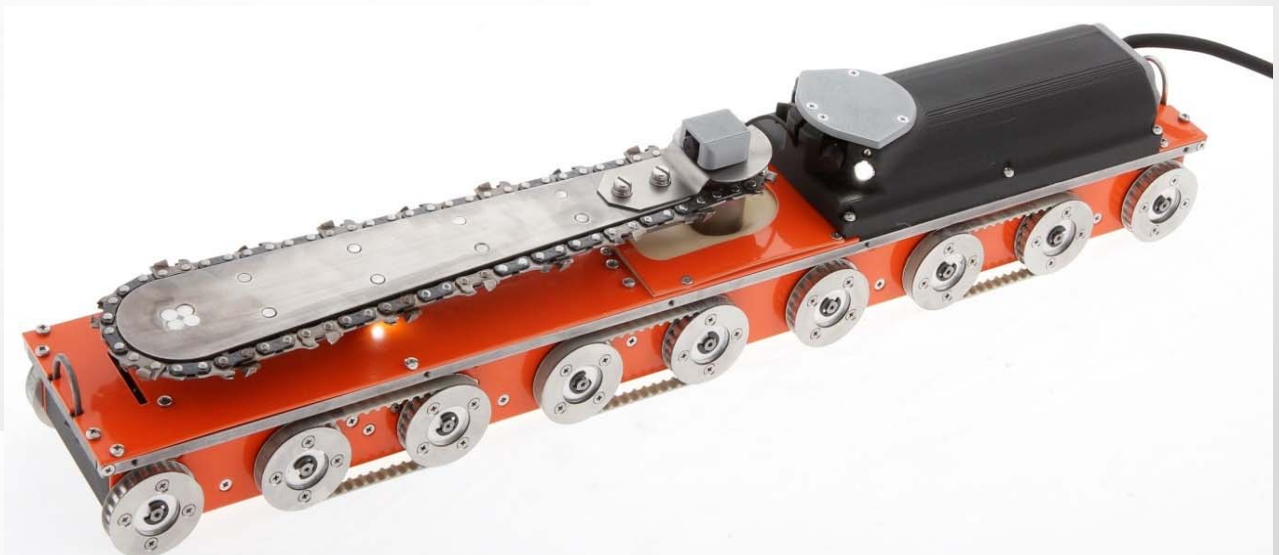
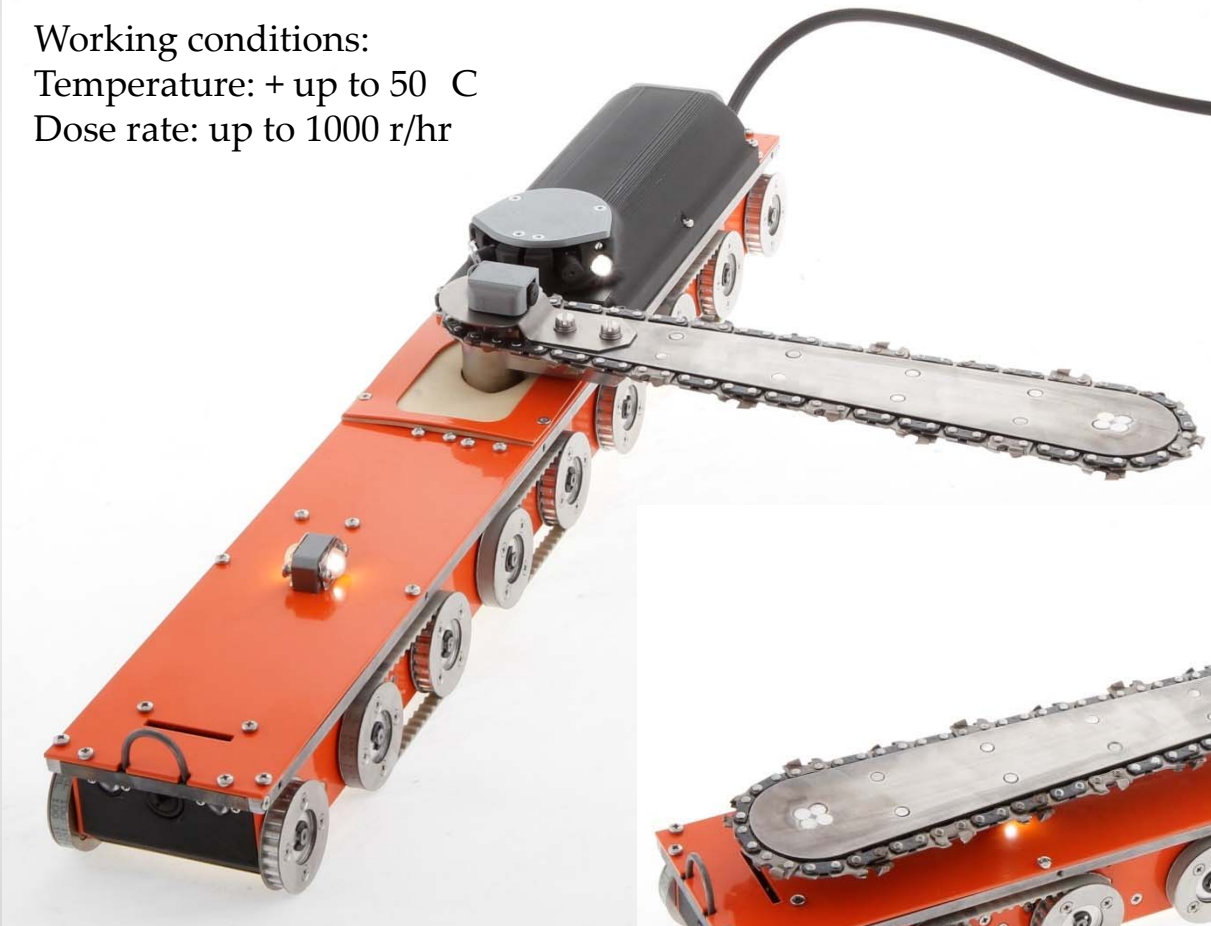
Electric drive

Saw blade extension beyond the robot
dimensions:

235 mm

Elevation of saw blade:

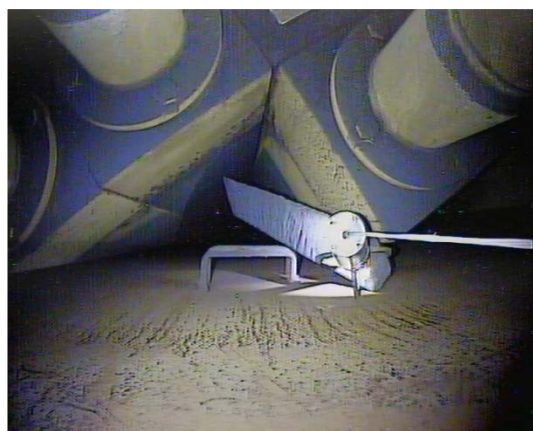
50 to 70 mm





Experience in equipment development for nuclear power plants with RBMK

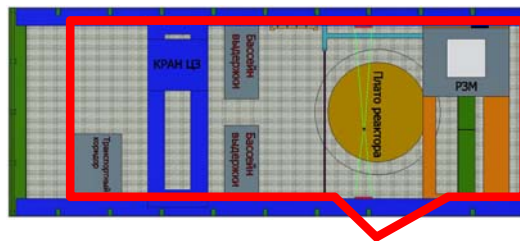
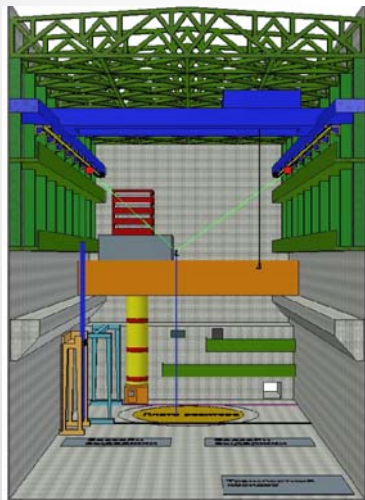
A robotic complex for remote cutting of the corners
of graphite columns and withdrawal of graphite fragments from the reactor core
on the power unit No. 1 of KuNPP, 2018



Experience in equipment development for nuclear power plants with RBMK

Cable manipulator MT-65

- Mounted and actively used in the CH of power units No. 1 and No. 2 of KuNPP
- Supply and installation projects for power units No. 3 of KuNPP, No. 1 and No. 2 of SNPP
- Completely replace a gantry crane
- Divisions of KuNPP (DNSS, CRS) and KuNER have been trained and used independently



Area of operation
In the central
hall of 1,2
KuNPP

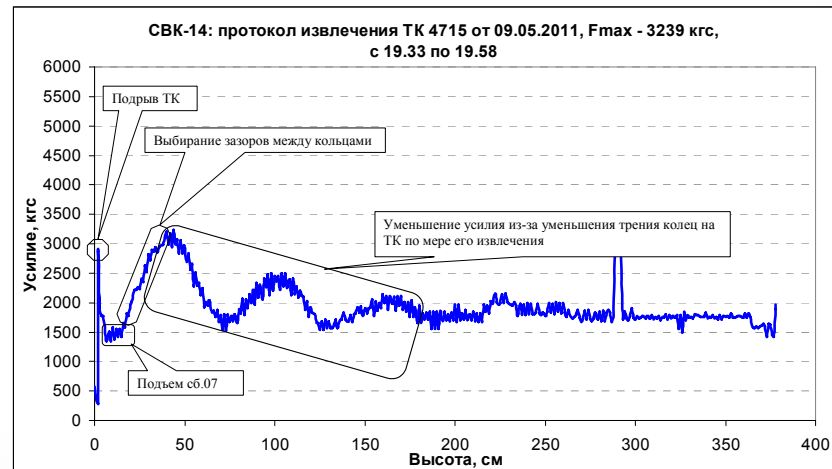


Experience in equipment development for nuclear power plants with RBMK



A robotic system of autonomous withdrawal of RBMK-1000 process channels

- Withdrawal of PCs without human intervention in the automatic mode with least effort
- The operator sets the maximum withdrawal force in the range of up to 10 tf
- No need in a central hall crane: fork lifting of PCs without using it
- Simultaneous use of several plants to accelerate the withdrawal of PCs
- Automatic recording of the withdrawal force throughout the withdrawal process



Applied at Smolensk NPP since 2011 and at Kursk NPP since 2012

Experience in equipment development for nuclear power plants with RBMK



Equipment for TV visual and instrumental control



Experience in equipment development for nuclear power plants with RBMK



Inspection of metalwork with an E-37 Photo Endoscope



Before:



Photo resolution:
768 x 576

After:



Photo resolution:
2048 x 1536



Thank you for your attention