Profile SFR-62

B-2 Aerodynamic facility

RUSSIA

GENERAL INFORMATION

NAME OF THE FACILITY	Aerodynamic facility "B-2" for research into hydrodynamic processes in the channels of the reactor heat-exchange equipment.
ACRONYM	Aerodynamic facility "B-2"
COOLANT(S) OF THE FACILITY	Air.
LOCATION (address):	FSUE «State Scientific Centre of the Russian Federation – Institute for Physics and Power Engineering named after A.I. Leypunsky», Obninsk, Kaluga region, 249033, Russian Federation.
OPERATOR	State Corporation "Rosatom".
CONTACT PERSON (name, address, institute, function, telephone, email):	Alexander S. Mikheyev, 1 Bondarenko Sq., SSC RF-IPPE, Obninsk, Kaluga region, 249033, Russia, Head of Laboratory, tel.: +7 484 39 9 84 39, mikheyev@ippe.ru.

STATUS OF THE FACILITY	In operation
Start of operation (date):	1970. Process flow diagram, measurement circuits and instrumentation were updated in 2011

MAIN RESEARCH FIELD(S)

- ☐ Zero power facility for V&V and licensing purposes
- ☒ Design Basis Accidents (DBA) and Design Extended Conditions (DEC)
- ☒ Thermal-hydraulics
- ☐ Coolant chemistry
- ☐ Materials
- ☐ Systems and components
- ☐ Instrumentation & ISI&R

TECHNICAL DESCRIPTION

Description of the facility

The test aerodynamic facility "B-2" is purposed for investigations of hydraulic characteristics, velocity fields in the channels of the heat-exchange equipment of liquid metal (Na, Pb, Pb/Bi), water and gas cooled reactors (fast reactors of BN, BREST, SVBR, VVER, VTGR type), turbulent coolant flow pattern in the channels with different cross-sections, basic research aimed at first-class staff education.

The experimental facility hall housing test sections is 41 m^2, 3 m in height. It houses auxiliary equipment: air coolers, a pulley block with a lifting capacity of 0.5 t, an electrical control

board. The processing equipment is taken outside and connected with the experimental facility hall by means of a thermal insulated air duct 500 mm in diameter. The blower – a high-pressure fan – is enclosed in a soundproof box.
To perform measurements, advanced techniques are used for research into velocity fields, velocity pulses, pressure of the airflow in the flow tube of FA test models and in the channels of the heat-exchange equipment.
To measure local velocities and velocity pulses of the air flow, tiny hydrometric and hot-wire anemometric converters are used. A multi-channel system produced by DANTEC is used to analyse signals. Absolute values of pressures and pressure differentials are measured by Metran-type converters. ON LINE computer systems of data acquisition and preprocessing are used for recording signals from converters.

Acceptance of radioactive material
No

Scheme/diagram

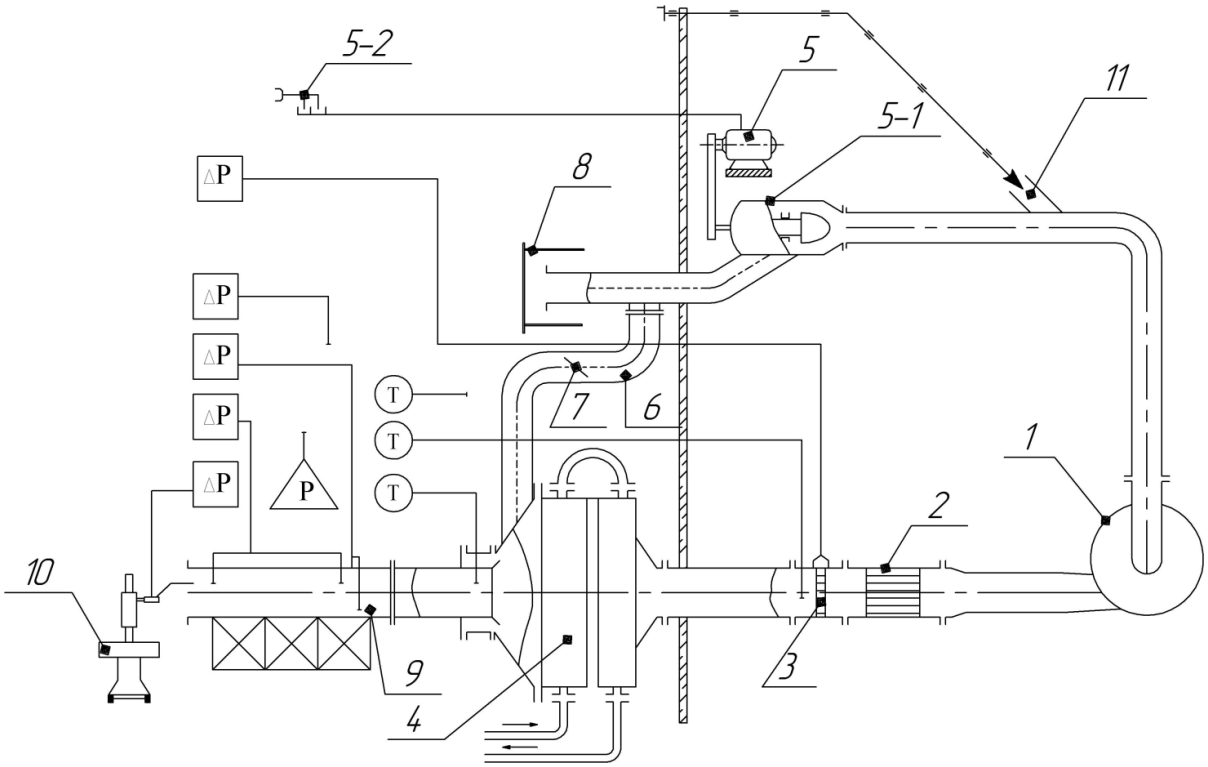

FIG. 1. Technological scheme of the B-2 test facility
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1 – blower; 2 – honeycomb; 3 – throttling orifice; 4 – air cooler; 5 – throttle electric driving motor; 5-1 – conical throttle (air flow regulator); 5-2 – control panel; 6 – by-pass line; 7 – valve; 8 – damper; 9 – experimental channel; 10 – pointing device for velocity probes; 11 – by-pass

3D drawing/photo

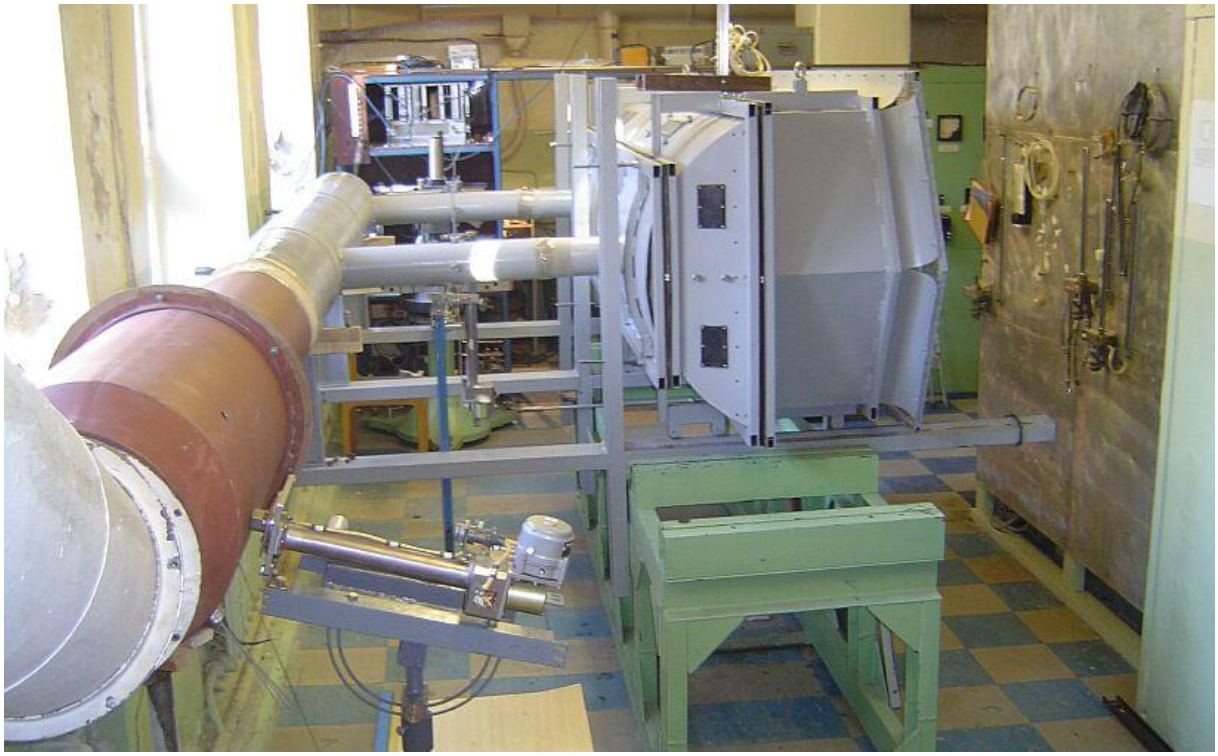

FIG. 2. Perforated steam-distribution plate (VVER-1500) test model in the circuit of the aerodynamic facility B-2.

Parameters table

Coolant inventory	Air
Power	60 kW
Test sections	
TS #1	*Characteristic dimensions* Dimensions: outer diameter - 1200 mm; total length including auxiliary sections - 9 000 mm
	Static/dynamic experiment Dynamic
	Temperature range in the test section Up to 50 ^{o}C
	Flow range (mass, velocity, etc.) 10 000 m^3/h
Instrumentation	• Velocity, velocity vector, velocity pulse probes coming in different designs (designer and producer – SSC RF-IPPE); • Metran-type converters of absolute pressure, pressure differentials (producer – a plant in Chelyabinsk); • Circuit gas (vortex) flowmeter of Metran type (producer – a plant in Chelyabinsk);

COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS

- An experimental study on velocity fields, friction induced shear stress distribution, flow friction characteristic of rod bundles. Results are published in a monograph, handbooks, proceedings of international conferences in the Czech Republic, France, USA.
- An experimental study on velocity fields, flow friction characteristic in the channels with repeated rib roughness, aimed at intensifying heat transfer and synthesizing experimental data.
- An experimental study on hydraulic circuits, with the combined effect of local hydraulic resistances, aimed at improving thermal hydraulic design codes for hydrodynamical analysis in compact complex-layout circuits, which is typical of reactor circuits.
- An experimental study on sodium flow distribution (simulation by means of the air flow) in the cross-sections of evaporators in the steam generators of BN-type reactors. Development of experiment-based devices for making sodium flows identical in the cross-sections of evaporators.
- An experimental study on velocity fields, hydraulic loss in the flow tube of the target complex with the lead-bismuth coolant (simulation by means of the air flow) as applied to accelerator-controlled systems.
- An experimental study on velocity fields in the steam generator of the VVER-1500 reactor, substantiating designs of perforated steam-distribution plate.
- An experimental study on hydraulic resistance and velocity fields in the flow tube of the cross-flow finned tube assembly as applied to passive cooling systems of the BN-1200 reactor. The purpose of the study is creating experimental data base to develop thermal hydraulic design codes.

A doctoral and two PhD dissertations were defended on the basis of experimental findings. Also, 6 patents for invention were obtained.

PLANNED EXPERIMENTS (including time schedule)

The following experimental study is planned in 2015-2016: obtaining experimental data on aerodynamic properties of finned tube assemblies for verification of design codes used to calculate sodium – air heat exchangers for advanced fast reactors.

TRAINING ACTIVITIES

Activities relating to training specialists as experimenters for the thermal hydraulic test facilities has to be agreed with State Corporation "Rosatom".

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