

Profile SFR-67

SGDI

RUSSIA

GENERAL INFORMATION

NAME OF THE FACILITY: Facility SGDI is designed for hydrodynamic studies of flow parts of reactor equipment models

ACRONYM: SGDI

COOLANT(S) OF THE FACILITY: Air

LOCATION (address): Federal State Unitary Enterprise "State Scientific Centre of the Russian Federation - Institute for Physics and Power Engineering named after A.I. Leypunsky", Russian Federation State Corporation "Rosatom"

OPERATOR: Mikheyev A.S.

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STATUS OF THE FACILITY

In operation

Start of operation (date): 1970. In 2005 the SGDI facility was entered into the State Register of Measuring Instruments and allowed for use in the Russian Federation. In 2011 the heat transfer equipment was upgraded and the flow path was refined

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

Facility SGDI is an open circulation loop connected to a pressure or exhaust air duct used for connecting the model under investigation. Air extraction (intake) is carried out from the facility hall through the air duct of 0.8 m diameter.

The coolant flow in the facility loop can be conducted by three blowers: pressure fan of 66000 m³/h capacity under outlet pressure equal to 0.03 MPa; fan of 10000 m³/h capacity under outlet pressure equal to 0.03 MPa, and compressor of 2200 m³/h capacity under outlet pressure equal to 0.05 MPa.

The air temperature in the loop amounts to 50 °C.

The circulation loop includes the following process units (according to the process layout): blower (1, 2 and 3); air cooler 4, mufflers 5; flow meters 6, 7; flow control valves 8, 9; process water valves 11-16; resistance thermometers 18; bypass 23. The models are placed at platforms and trestles of the facility hall, the height, width and length are equal to 7 m x 7 m x 25 m correspondingly. The flow meters are of a vortex type with a fractional uncertainty of 1%. When blower 1 is in operation, the flow control is realized by flow control valves and bypass line interception. When blowers 2 and 3 are in operation, the flow rate is controlled by frequency valves.

The loop air ducts of 0.8 m, 0.5 m, 0.3 m diameter are made from 1X18H9T steel and D-16 aluminum alloy.

In the course of measurements either standard or self-engineered hydrometric and thermoanemometric probes are used. The measurement tools are calibrated at facilities ADS-30.50 and wind tunnel Wk 818035-E. Sensors Metran-100 and Metran-150 are used as secondary pressure converters. The sensor readings are recorded with the help of the automated data acquisition and processing system followed by the analysis of the data obtained in the online mode.

Acceptance of radioactive material

No

Scheme/diagram

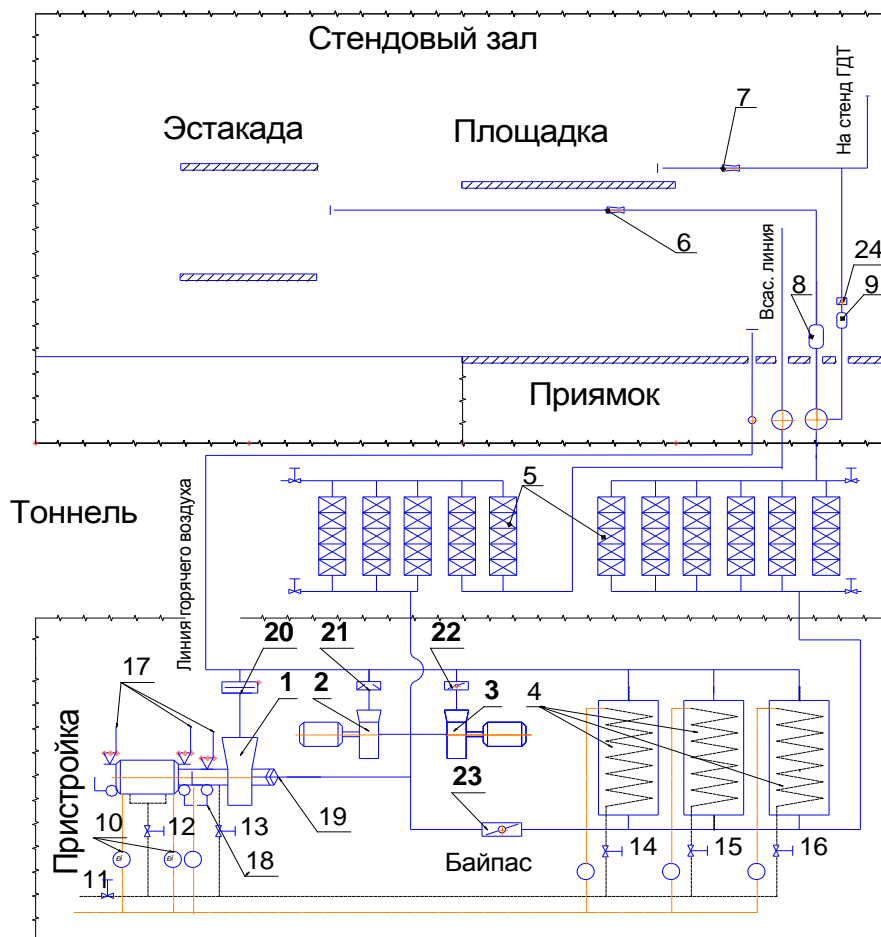


FIG. 1. Scheme of the SGDI facility hall (clockwise): trestle, platform, section line, sump, bypass, annex, hot air line, tunnel.

1 – pressure fan E1050-13-4; 2 – compressor VF-37/1.5-SM4UZ; 3 – fan TzV-18; 4 – air cooler VO-4Ch13-1350-4; 5 – mufflers; 6, 7 – flow meters; 8, 9 – flow control valve; 10 – flow switch; 11-16 – process water valves (pressure head); 17 – oil level sensors (level gages); 18 – temperature sensors (resistance thermometers); 19 – guide apparatus; 20 – pressure fan shutter; 21 – check valve; 22 – fan shutter; 23 – bypass; 24 – pressure line shutter

3D drawing/photo



FIG. 1. View of the SGDI facility hall

Parameters table

Coolant inventory	Air
Power	700 kW
Test sections	
TS #1	<u>Characteristic dimensions</u> Facility hall: 7 m x 7 m x 25 m Air ducts: 0.8 m, 0.5 m, 0.3 m
	<u>Static/dynamic experiment</u> Static

	<u>Temperature range in the test section (Delta T)</u> 10-50 °C
	<u>Operating pressure and design pressure</u> 0.01-0.05 MPa
	<u>Flow range (mass, velocity, etc.)</u> 200-66000 m ³ /h
Coolant chemistry measurement and control (active or not, measured parameters)	In the course of facility operation flow rate, pressure, temperature and coolant relative humidity are controlled
Instrumentation	<ul style="list-style-type: none"> • TESTO, Dwyer, AKTAKOM, and self-engineered heat-loss anemometers; • Sensors of absolute and differential pressure “Metran-100”, “Metran-150” (manufacturer – Chelyabinsk factory); • Pressure calibrators “Metran PKD-10M”, “Metran 502-PKD-10P”; • Angular and linear displacement transducers, LIR type (manufacturer – St. Petersburg factory); • Vortex and fluidic flow meters, “IRGA” type (Du10, Du50, Du80, Du500 –Belgorod factory) and “IRVIS” (Du300 –Kazan factory)

COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS

The following studies were performed:

- Justification of air simulation of hydrodynamic parameters of reactor flow parts and heat transfer equipment cooled by incompressible liquids (water, liquid metal, etc.).
- Studies on flow parts of sodium cooled fast reactors and recommendations.
- Studies on hydrodynamic parameters of distribution manifold systems with central and lateral coolant supply in a wide range of collector geometry parameters. Recommendations for hydrodynamic optimization.
- Studies on the influence of loops (for multiloop reactors) on coolant flow rate distribution at the reactor core inlet.
- Work on the external flow of the group of buildings at Novovoronezh NPP.

PLANNED EXPERIMENTS (including time schedule)

It is planned to perform a set of experimental studies in 2014-2016:

- Hydrodynamics of the flow part model of the “BREST” reactor;
- Work on wind load action on a group of buildings of an advanced NPP.

TRAINING ACTIVITIES

The training activity for specialist-experimentalists at the SDGI facility should be coordinated with the State Corporation “Rosatom.”

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