

Laboratory of Thermal Turbomachinery (LTT)

University of Belgrade-Faculty of Mechanical Engineering

Steam Turbine Performance Testing

Introduction

Laboratory of Thermal Turbomachinery is research and teaching institution at the University of Belgrade. The Laboratory is holding classes in: Steam Turbines, Gas Turbines, Turbocompressors, Thermal Turbomachinery and Thermal Power Plants. The University of Belgrade has about 100 years experience in research and teaching in this area.

The Laboratory is specialized in

- development of tools for aerodynamic design of thermal turbomachinery,
- development of tools for thermodynamic calculations in thermal power plants,
- performing research, optimization and design (aero and thermal) of thermal turbomachinery cycles and power plants and CHP,
- testing of steam turbine plants.

LTT has cooperation with leading companies in area of thermal turbomachinery worldwide.

Testing of Steam Turbine Plants

LTT is a laboratory with official accreditation¹ for testing of steam turbine and steam turbine plants according to standards:

- IEC 953-1, 953-2 and 953-3,
- DIN 1943,
- ASME PTC 6.

LTT performs:

- thermal acceptance tests,
- performance assessment tests

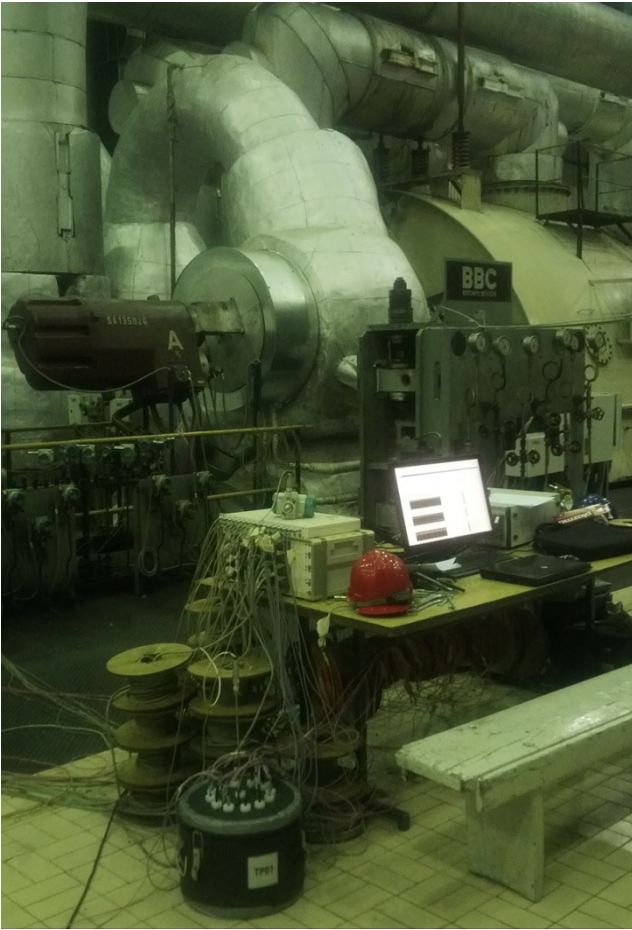
of steam turbines and steam turbine plants.

Instrumentation

LTT is equipped with accurate and reliable instrumentation:

	Accuracy Class	Numbers	Producer
Pressure transmitters (absolute, gauge, differential)	0.04-0.07%	>120	Rosemount (USA), Yokogawa (Japan), Siemens (Germany)
Temperature probes: - Pt-100 - thermocouples	class A class 1	>250	Rössel (Germany)
Powermeter	0.2%	1	Yokogawa (Japan),
Ultrasonic flowmeter		1	GE Panametrics (USA)
Data acquisition system		220 channels	National Instruments (USA)

¹ <http://www.registar.ats.rs/predmet/364/>



In a power plant



Preparation for test in the Lab

Calibration

We have highly sophisticated equipment for calibration of instruments for pressure and temperature measurement.

System for pressure calibration

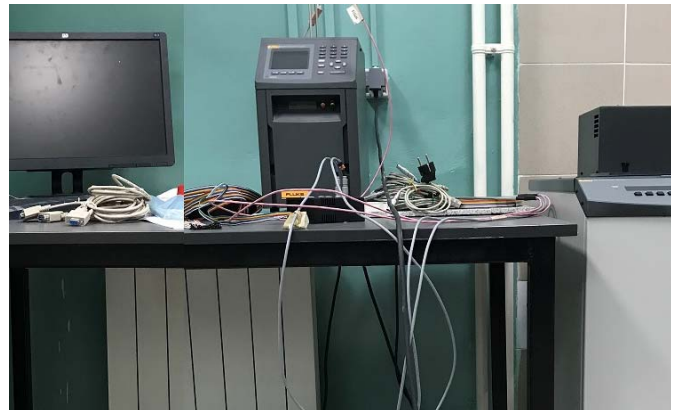
- FLUKE RUSKA 2465 – range: 15 mbar – 7 bar,
- FLUKE DH Instruments PC-7200 500 - range: 5 bar – 400 bar.

System for temperature calibration

- FLUKE- Hart Scientific Deep well Calibration Bath 7341, S/N: -30 °C – 150 °C
- FLUKE- Hart Scientific Metrology well calibrator 9173: 50 °C – 700 °C



Pressure calibration



Temperature calibration

Experience

Laboratory has more than 50 year experience in the steam turbine plant testing. In the current form with modern instrumentation we operate since 2002.

The Laboratory performed number of acceptance and assessments tests of steam turbines and steam turbine plants in the range from 100 MW to 700 MW.

In the record of the laboratory we have tests which results have shown that guarantees were not fulfilled and tests in which turbines have shown much higher efficiency then guaranteed with financial consequences for parties.

Service

LTT offers its customers a portfolio of testing and measurement-related services. Our approach to customer's requests is modular, so that each phase of testing can be supplied separately from the others. This enables us to offer a high level of flexibility providing the best solution for you.

Technical consultancy

LTT can assist you from the early stages of a testing process:

- Verification of contractual requirements
- Technical documents review
- Consultancy for testing methodology and specification
- Tailor-made solutions and advice for metering systems
- Test design
- Detailed test procedures editing, based on international codes requirements
- Review of customer testing procedures
- Plant thermodynamic model for performance curves mapping

Scope of performance testing

A performance test consists in more than accurate measurements. We supervise the following activities:

- Meeting with final the customer and with the Parties
- involved in test coordination (Suppliers, Commissioning teams, Owners)
- Site personnel management for testing
- Plant/machine inspection for testing readiness
- Third-party supervision of Suppliers testing
- High accuracy temporary instrumentation provided and installed by LTT
- Data acquisition system and software for data acquisition and real time performance calculations
- Currying out the complete performance test

Calculations and results analysis

- Performance calculation, corrected to contractual reference conditions
- Water/steam equation of state (IAPWS-IF97, IFC-67) for thermodynamic properties
- Test uncertainty calculation
- Guarantee comparison of the test results and the guarantee values
- Technical report editing according to international testing codes specifications
- Support to customer and root-cause search in case of non-compliance of the component/plan
- Calculation of operating performances of every component of a steam turbine plant
- Calculation of deviation of perfomance components and cycle parameters compared to the design and infulences of these deviation on the plant efficiency and the electrical output.

Contact:

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Акредитационо тело Србије

Accreditation Body of Serbia

01407

Београд

Belgrade

додељује

awards

СЕРТИФИКАТ О АКРЕДИТАЦИЈИ

Accreditation Certificate

којим се потврђује да тело за оцењивање усаглашености
confirming that Conformity Assessment Body

ИНОВАЦИОНИ ЦЕНТАР МАШИНСКОГ ФАКУЛТЕТА
У БЕОГРАДУ ДОО БЕОГРАД

Центар за квалитет

Лабораторија за топлотне турбомашине

Београд

акредитациони број

accreditation number

01-302

задовољава захтеве стандарда

fulfils the requirements of

SRPS ISO/IEC 17025:2006

(ISO/IEC 17025:2005)

те је компетентно за обављање послова испитивања

and is competent to perform testing activities

који су специфицирани у важећем издању Обима акредитације

as specified in the valid Scope of Accreditation

Важеће издање Обима акредитације доступно је на интернет адреси: www.ats.rs

Valid Scope of Accreditation can be found at: www.ats.rs

Акредитација додељена

Date of issue

20.11.2017.

Акредитација важи до

Date of expiry

19.11.2021.



Акредитационо тело Србије је потписник Мултилатералног споразума о признавању еквивалентности система акредитације Европске организације за акредитацију (EA MLA) и ILAC MRA споразума у овој области. / ATS is a signatory of the EA MLA and ILAC MRA in this field.