

TURBINE GOVERNING SYSTEMS

PRODUCTS

Electrical Engineering Institute Nikola Tesla a. d. Belgrade has many years of experience in the production, delivery and commissioning of turbine governing systems for hydraulic turbines. Our products are of modern construction with a control unit based on a digital platform. For small units the control unit is based on a microcontroller, while for larger units it is based on a PLC platform. On other hand, on small and micro units, it can be more cost effective to implement software solution for turbine governing algorithm in the PLC of the unit control system.

The control unit is modular in both hardware and software terms, allowing easy upgrades, extensions of functionality and adaption of the governor system to each project individually.

The products are intended for the governing of all types of turbines: Francis, Pelton, Kaplan and Banki.

Together with our partners, the Institute implements turnkey projects. Technical input data from the turbine manufacturer are sufficient for us to design and to produce both, hydraulic and electrical part of the turbine governing system.

We provide the Customer with complete support during the installation process, pre-acceptance tests, commissioning, acceptance tests and trial operation of the turbine governing system. We organize training courses for the Customer's staff and provide service support and support in spare parts within and outside the warranty period.

MAIN FUNCTIONS

Turbine governor does the control of:

- Guide vane opening (Francis & Kaplan);
- Runner blade opening (Kaplan);
- Spear and Deflector position (Pelton);
- Unit speed;
- Generator active power;
- Water head;
- Turbine discharge/flow.

Participates in:

- Unit start-up;
- Acceleration & idling of the unit;
- Synchronization of the unit;
- Unit operation with isolated load;
- Unit operation in the grid;
- Unit unloading and stopping.
- Executes unit protection functions.
- Communicates with unit control system.
- Communicates with power plant SCADA.



REFERENCES

1. HPP Raška, 2 x Pg=4000kVA (Francis) - 2014.
2. SHPP Crkvine, Pg=750kVA + Pg=450kVA (Francis) - 2015.
3. SHPP Rečica, Nova Varoš, Srbija, Pg=1075kVA + Pg=795kVA (Francis) - 2015.
4. SHPP Lisine, Pg=925kVA (Pelton) + Pg=740kVA + Pg=380kVA (Francis) - 2016.
5. SHPP Dubočica, Pg=875kVA (Pelton) - 2017.
6. SHPP Igrišt, Pg=600kVA (Pelton) - 2017.
7. SHPP Stenjevac, Pg=765kVA + Pg=395kVA (Francis) - 2018.
8. SHPP Brusnik, Pg=1580kVA (Kaplan) - 2020.
9. SHPP Krepoljin, Pg=855kVA + Pg=425kVA + Pg=425kVA (Francis) - 2020.

SERVICES

Electrical Engineering Institute Nikola Tesla a. d. has decades of experience in all types of turbine governing system testing. Tests and determination of properties and parameters of turbine control systems, based on tests results, are performed in accordance with international technical standards IEC60308 and IEC61362. Within the Laboratory for testing and calibration of the Institute, we also have a Specialized laboratory for testing of the turbine governing systems, which is accredited by the national Accreditation Body of Serbia (ATS). Tests are performed on new or revitalized turbine governing systems and on existing turbine governing systems that are in operation.

TESTS ON NEW OR REVITALIZED TURBINE GOVERNING SYSTEMS

Our engineers are competent at taking part in the preparation and execution of Factory acceptance tests (FAT) of turbine governing system equipment. We have experience in preparing of programs, schedules and testing procedures for the Buyer, which all are subject to a contract with the Supplier. Our engineers contribute, with their participation and advices during execution of FAT, to a more successful and high-quality Buyer perception of the features and functionality of the system that is the subject of test.

During the preparation and execution of Site Acceptance Test (SAT), our engineers participate in the activities in a very similar way as during the factory acceptance tests. With their previous experience in the field of acceptance tests, our engineers contribute to a better managing of the conditions for performing certain tests, which is useful for the Buyer and for the Supplier. Our engineers are most often useful to the Supplier in the technical and organizational sense, while our engineers are always useful to the Buyer both in the technical and in the advisory sense.

Guarantee tests are performed in order to determine the characteristics and parameters of the turbine governing system and compare them with those specified in the Special technical conditions, which are integral part of the Contract on production, delivery and commissioning between the Buyer and the Supplier. Our engineers can prepare the program, schedule and test procedures. After mutual coordination with the Purchaser, with the participation of the representatives of the Buyer and the Supplier, our engineers test the turbine governing system, after which they form a report with the test results. Our Specialized laboratory has the complete test equipment required to perform complex tests as guarantee tests are.

TESTS ON EXISTING TURBINE GOVERNING SYSTEMS

On the turbine control systems that are in operation, we perform tests resulting with:

Determination of the current state of the system;
Determination of the causes of improper operation of the system and system repair;
Determination of the quality of the unit participation in Load-frequency control (LFC).

Determining the existing condition of the turbine control system in operation is achieved by performing a set of tests which is agreed with the Client. The scope of the tests may be equal or similar to the scope of the tests performed during the acceptance or guarantee tests. Also, we perform this type of tests for the purpose of assessing the remaining system resources and planning system replacement and / or revitalization of the unit..

We have significant experience in the periodic inspection and testing of turbine governing systems in operation, with the aim of determination of the causes of improper operation or system downtime. Also, after determination of one or more reasons of improper system operation, with the consent of the Purchaser, we proceed to the replacement of the malfunctioned part and / or readjustment of the governing system.

By introduction a large number of alternative power sources and by liberalization of the market, the importance of providing LFC services for production units has gained in importance. Our engineers have significant experience on more than 50 hydro and thermal units in testing and readjustment of existing turbine governing systems, whose ultimate goal is to achieve a response of the unit that is in accordance with the requirements of the grid code.

REFERENCES (*last 10 years)

1. HPP „Đerdap 2“ A1, A2, A4, A5, A9 i A10, Pg=27,5MVA, Site acceptance test (SAT), 2009.-2010.
2. HPP „Đerdap 2“ A10, Pg=27,5MVA, Guarantee test, 2009.
3. Testing the quality of unit work in Load-frequency control, study, 48 hydro & thermo units were tested in power range from 12 to 700MVA, 2011.-2016.
4. HPP „Piva“ A1, A2 i A3, Pg=120MVA, Test for determination of existing condition, 2016.
5. SP HPP „Bajina Bašta“ R1, Pg=315MVA, Site acceptance test (SAT), 2016.
6. HPP „Đerdap 1“ A4, Guarantee test, Pg=211MVA, 2017.
7. HPP „Bočac“ A1, A2, Test for determination of existing condition, Pg=58MVA, 2019.
8. HPP „Piroć“ A1 i A2, Test for determination of existing condition, Pg=44,5MVA, 2020.