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STEAM-, GAS-TURBINE, AND COMBINED-CYCLE POWER INSTALLATIONS, AND THEIR AUXILIARY EQUIPMENT

Experience Gained from Operation of the GTE-160 Gas Turbine Installation and Prospects for Its Modernization

A. S. Lebedev[a], A. Yu. Pavlov[a], F. Richter[b], and A. A. Adamchuk[c]

[a] *Siemens Gas Turbine Technologies, Sverdlovskaya nab. 44, lit. D, BTs Leto, St. Petersburg, 195027 Russia*
[b] *Siemens AG, Huttenstr. 12, Berlin, 10553 Germany*
[c] *Silovye Mashiny, ul. Vatutina 3, lit. A, St. Petersburg, 195009 Russia*

Abstract—Experience gained from operation of the GTE-160 gas turbine installation produced by Silovye Mashiny according to the licensing documentation of Siemens since 2001. As of June 2012, 32 GTE-160 gas turbine units had been supplied and were in successful operation at power stations in different regions of the Russian Federation and abroad as part of PGU-450 and PGU-230 combined-cycle power plants. Technical solutions are presented the use of which excludes embrittlement of materials at outdoor air temperatures below –40°C and ensures reliable operation of the gas turbine unit without using expensive air heating systems in an integrated air cleaning device at low temperatures.

Keywords: gas turbine unit, combined-cycle power plant, construction, integrated testing, field experience, reference, modernization, negative temperatures of outdoor air

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In December 2011, the companies Silovye Mashiny (Power Machines) and Siemens AG signed the final documents on establishing the joint venture in Russia called Siemens Gas Turbine Technologies for manufacturing gas turbines in the CIS (Commonwealth of Independent States) countries and rendering maintenance services for them. The paper presents the main stages of establishing the new joint venture, as well as the objectives and tasks to be solved by specialists of this enterprise.

Activities on setting up manufacture of the GTE-160 gas turbine installation at Silovye Mashiny were commenced in 1991, the time at which the Leningrad Metal Works (the production division of Silovye Mashiny) and Siemens established the joint venture Interturbo, the main production activity of which was assembling V94.2 gas turbines (the prototype of the GTE-160 installation) from ready-made components [1].

The first gas-turbine units (GTUs) were fully assembled from German components, but since 1994, parts manufactured at the Leningrad Metal Works (LMZ) began to be used in them. Initially, the fraction of these parts was only 3% of the total amount. Subsequently, the fraction of components and parts manufactured at LMZ (so-called localization) increased continuously as more experience was gained with production, as the technology was mastered, and as lathes and accessories were purchased. In 2001, a license contract permitting production and sales of a GTE-160 gas turbine (developed on the basis of a V94.2 turbine) was signed, which became a logical continuation of the long and painstaking work for mastering the manufacture of components for this GTU at LMZ. The gained experience and legal rights acquired within the framework of the licensing contract opened the possibility of implementing independent supplies of GTE-160 gas turbine installations with their production localized up to 60%.

As of June 2012, the number of the GTE-160 installations manufactured at Silovye Mashiny according to the licensing documentation of Siemens totaled 32 GTUs, which have been supplied and are successfully operating at power stations in different regions of the Russian Federation and abroad as part of PGU-450 and PGU-230 combined-cycle power plants.

Construction of the **Kaliningrad TETs-2** cogeneration station (owned by Inter RAO EES) was a really significant event both in the Russian machinery construction industry and in the Russian power industry, and became a resolute step toward achieving energy independence of the region, which is a Russian semienclave. It was for the first time in the history of the modern Russian power industry that a PGU-450 combined-cycle power plant consisting almost completely of domestically produced equipment and fitted with two pilot GTE-160 gas-turbine installations was put in operation.

The PGU-450 power unit at the Kaliningrad TETs-2 cogeneration station was put in experimental commercial operation after its successful integrated trial running for 72 h on its main gas fuel in the diffusion combustion mode carried out in October 23–26, 2005. The tests showed that the operational state of the