HEAT ENERGY.

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Abstract: *Mechanical energy of thermal energy is mainly converted into electrical energy through steam turbines in IES, IEM and NPPs all over the world. We can use thermal energy to heat our buildings in our lifestyle.*

Key words: *Energy, thermodynamics, fluid and gas mechanics, thermodynamic cycles, power plants, fuel, steam turbine.*

Heat energy is a field of energy and heat engineering that deals with the conversion of heat into other types of energy, mainly into mechanical energy and through it into electrical energy, i.e. heat energy. The basis of the entire energy system of the world is thermal energy. 2/3 of the world's power plants use heat, mainly steam, in the Rankine cycle and the Brayton cycle in gas turbines. The theoretical basis of thermal energy is thermodynamics, heat and mass exchange, and fluid and gas mechanics. The main task of heat energy is the problem of rational use of heat energy in industry and utilities. The study of heat energy is thermodynamic circuits and schemes of power plants, their level of perfection, fuel combustion, heat transfer issues, thermophysics of working fluids and coolants. features etc. Thermal energy conversion is carried out in various machines, devices and devices, which are divided into:

production: heat generator;

furnace collector: solar collector;

conversion: steam turbine;

Transfer: Heating main, Heat exchanger;

consumers: heater;

As with all cyclic heat engines, the higher the combustion temperature, the higher the efficiency. The limiting factor is the ability of the steel, nickel, ceramic or other materials that make up the motor to withstand heat and pressure. Most of the engineering work is focused on removing the heat from the parts of the turbine. Most turbines also try to recover heat from the wasted exhaust gases.

Recuperators are heat exchangers that transfer heat from exhaust gases to compressed air before combustion. In the combined cycle, the heat is transferred to the steam turbine systems. And in combined heat and power (CHP), the waste heat is used to produce hot water.

Mechanically, gas turbines can be much simpler than reciprocating internal combustion engines. Typical turbines may have only one moving part: a shaft/compressor/turbine/reciprocating rotor assembly (see figure below), excluding the fuel system.

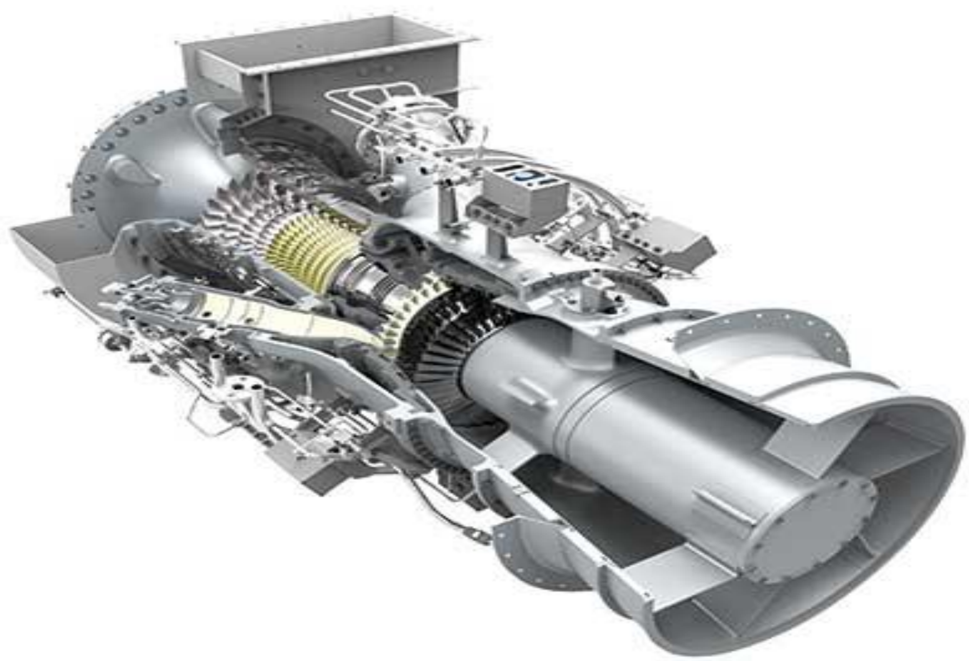
More complex turbines (as used in modern jet engines) may have multiple shafts (coils), hundreds of turbine blades, moving stator blades, and an extensive system of complex tubes, combustion chambers, and heat exchangers.

As a general rule, the smaller the motor, the higher the speed of the shaft(s) required to provide the maximum linear speed of the blades.

The maximum speed of the turbine blades determines the maximum pressure that can be achieved, resulting in maximum power regardless of engine size. A jet engine spins at about 10,000 rpm and a micro turbine spins at about 100,000 rpm.

A gas turbine is an engine in which, during continuous operation, the main organ (rotor) of the device (in other cases, steam or water) is converted into mechanical work. In this case, the flow of the working substance affects the fixed blades around the circumference of the rotor and sets them in motion. According to the direction of gas flow, turbines are divided into axial (gas moves parallel to the axis of the turbine) or radial (moves perpendicular to the same axis). There are single and multi-stage mechanisms.

The gas turbine can act on the blades in two ways. First, this is an active process, where gas is supplied to the workplace at a high speed. In this case, the gas flow tends to move in a straight line, and the curved blade part standing in its path pushes it aside and turns itself. Second, it is a reactive type process that uses low gas supply rates but high pressures. type is rarely found in its pure form, because their turbines contain it, which acts on the blades along with the reaction force.



The technical basis of modern heat energy is thermal power plants of thermal power plants (IES) consisting of boiler units and steam turbines.

A steam turbine is a turbine that converts the potential energy of steam into kinetic energy, and then into the mechanical work of a rotating shaft; It is the main engine that rotates electric generators in a thermal power plant. There will be active and reactive turbines. The steam turbine is relatively compact, simple, economical, allows to use steam with high parameters, to obtain clean condensate, and to transmit steam with various parameters to consumers along with the production of electricity. There are fixed (stationary) and transport (mounted on a ship) types. Fixed steam turbines include condensing turbines, cogeneration turbines, and others. Almost all Steam Turbines are multi-stage. It is manufactured with single and multiple (up to 4) casings, single and multiple (up to 3) shafts. A steam turbine is also used to drive centrifugal blowers, compressors, and pumps. Heat energy as an integral part of the energy industry. Among the traditional types, thermal energy dominates on a global scale, 46% of the world's electricity is coal-based, 18% is gas-based, and about 3% is oil produced due to the burning of biomass. makes up 80% of the production of the world's power plants. For 2013, the average efficiency of thermal power plants was 34%, the most efficient coal-fired power plants were 46%, and the most efficient gas-fired power plants were 61%. 47% of its energy was produced by burning gas and 18% by burning coal. Hydropower and nuclear power plants produced 17% and 16%, respectively. There are 88 thermal power plants in Kazakhstan. Another 9% are hydroelectric, 3% are renewable energy (wind and solar). Coal power plants in Kazakhstan have 74% shares. Natural gas power plants - 11% and liquid fuel (fuel oil, diesel fuel) - 4%. Kazakhstan has a total of 69 thermal power plants

station works: 8 national and 61 private. The energy industry of countries such as Poland and South Africa is almost entirely based on coal, and the Netherlands is based on gas. China, Australia and Mexico have a very high share of thermal energy. According to the European Electricity and Heat Association (VGB Power Tech), until 2030, energy production will grow annually by 1.3% for the European Union and 2.5% for the rest of the countries [7], The demand will increase from 3.0 TWt in 2002 to 4.4 TWt in 2020. Automation and automated control in the thermal energy industry. The most important feature of the energy system that distinguishes it from other large industrial and production associations is the impossibility of storing the finished product and disproportionality of the processes of electricity production, distribution and consumption. simultaneity. Between the total power produced by power plants and consumed in the power system. A change in the amount of power produced will inevitably lead to a change in its consumption. This process, as a rule, is the mode of operation of the power system is accompanied by changes in its parameters: voltages, currents, network frequency, etc. The energy system is generally called a large system, because it consists of subsystems that interact with each other.

The rapid development of automation in thermal energy has revealed a number of management problems.

These are:

1) Large inertia of dynamic properties of heat and material processes.

2) Great uncertainty of the properties of the control object.

3) Time variability of the properties of the control object, which requires additional time to adjust the control system during operation.

A steam turbine is a turbine that converts the potential energy of steam into kinetic energy, and then into the mechanical work of a rotating shaft; It is the main engine that rotates electric generators in a thermal power plant. There will be active and reactive turbines. A steam turbine is relatively compact, simple, economical, able to use high-parameter steam, obtain clean condensate, generate electricity, and provide consumers with steam with various parameters.

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