

# Features of automation of power supply systems

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**ABSTRACT:** This article covers the analysis of different control system for power supply system. Possibilities of using telemechanical and dispatching control systems in the electric power supply system (ETT) are presented. Control is addressed through automated civil engineering systems integration and dispatch control system schemes.

**KEY WORDS:** control system, Predictive analysis, dispatching control systems, efficient operation.

## I. INTRODUCTION

An automated control system is a control system that ensures efficient operation of an automation facility without operator intervention in the main operating modes. The collection, processing, transmission and storage of data used to provide control is carried out with the help of computers and automation equipment [1].

Based on the aggregated data on the dispatching system, it will be possible to develop recommendations to the building owners to reduce the energy consumption of the building as a whole, without harming the production process. [4]

As a result of the operation of the system with the help of software and hardware, messages, various reports, tables or other documents are created for workers. [1]

The general integrated automation system is divided into local systems that manage processes within the subsystem of a building, in particular, one of such subsystems is the power supply system (Fig. 1).

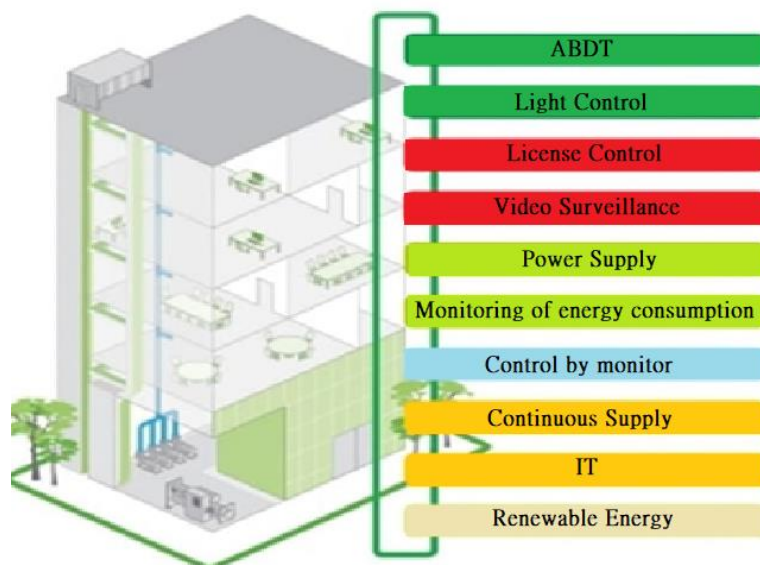


Fig1. Integrating automated civil engineering systems



## II. LITERATURE SURVEY

The power supply automation system solves the following tasks:

An electric lighting system is the same consumer of electricity as, for example, an air conditioning system, and requires a separate automation solution. Therefore, it is not correct to develop the automation of electric lighting as part of the automation of the power supply, but if the automation is minimal, sometimes the projects are combined.

Automatic inclusion of backup sources of power supply. Monitor the state of the network and switch to another power source when it leaves the specified parameters. In individual projects, additional requirements for remote control or power distribution may be imposed on the automatic input of sources [2].

Usually, all buildings with 1st category consumers of power supply are equipped with automatic input of their sources, but in the standard version, the maximum value displayed by the dispatcher determines which power source is the main or reserve;

- control of the quality of electricity in the distribution network of the building according to the specified parameters (technical calculation), keeping a log of parameters. To implement this feature, you will need to install additional (superfluous for the system operation) equipment, which means that there will be direct unnecessary costs. These costs are appropriate for studying the causes and consequences of emergency situations in the system, to determine the exact culprit of the incident;

- balancing of electricity between consumers of different levels. The system can be configured in such a way that in the event of a power shortage, the system automatically shuts down the lowest priority consumers, which we call prolonging the operation of higher priority consumers. With the given parameters, the system will be able to disable certain consumers to protect them;

- this is what we mean by the ability to display information and remotely control devices from the dispatch console. The ability to remotely control the switches distinguishes the traditional power supply dispatching system from the automated one with a simple display of the status of some devices on the monitor [3].

The use of telemechanics significantly increases the cost of equipment, therefore, if a decision is made to use them, it is advisable, because it is recommended to require additional costs for the development of control algorithms, excluding the influence of the human factor as much as possible [4].

## III. METHODOLOGY

Telemechanical and dispatching control systems of the electric power supply system (ETT).

An automated control system is a "man-machine" system that ensures the efficient operation of an object, in which the collection, transmission and processing of data necessary for the implementation of control functions is carried out using automation and computing techniques [5].

If a lower power consumption control system is built, then the abbreviation - automated power supply (AET-Energo) is often used. The latter can be developed as a separate isolated system or be part of the general AET-Energo. In general, the highest level of the enterprise management hierarchy is implemented with the help of an automated enterprise management system [4].

If computing techniques are used to solve complex interrelated tasks of managing the energy department of an industrial enterprise (control of heat, water, gas supply, etc.), then it is customary to call such a system as an automated power supply system (AET) [4].

These dispatch control systems differ from the corresponding automation systems primarily in the dominant role of the person (dispatcher) in the control loop. Reception and transmission of control signals is carried out by the dispatcher using specially organized channels and communication lines.

Full automation of enterprises in complex systems is usually difficult to implement due to the lack of analytical hardware to control processes, as well as the unpredictability of all possible modes of operation. Therefore, along with automation and telemechanics devices, certain functions are performed only by a person (operator), and the control system becomes an automated dispatch control system (ADBT) [6].

The operating modes of individual elements in the power supply system of industrial enterprises are interconnected. If the most important of them have stable monitoring and control operations concentrated in one place (control room), the coordinated action of all these elements is ensured.

With the help of telemechanics, the dispatcher receives information about the parameters of the energy consumption mode and the state of the switching devices at the main substation. With these devices, control commands are transmitted from the control room to the objects.

When the dispatcher communicates with the control points by phone, a significant time interval is taken from the moment of prompt intervention to execution. In the simplest case, control dispatching can be carried out using a telephone connection between the dispatching office and the service personnel of remote facilities. In addition, there is a high probability that the information will not be received or will be incorrect when sending only by telephone.

In addition, the dispatcher itself has the ability to change the operating mode of the controlled system by sending signals directly to the controlled objects. The dispatcher's work will be more effective if the information about the operating modes of the system elements comes automatically from the devices installed at the dispatching points [7].

#### IV. EXPERIMENTAL RESULTS

If there are few control points and the distance between the control points is significant, remote control can be used. For this, it is necessary to transfer the control and signaling equipment from the local control panels to the central dispatching point (SDP) (Fig. 2).

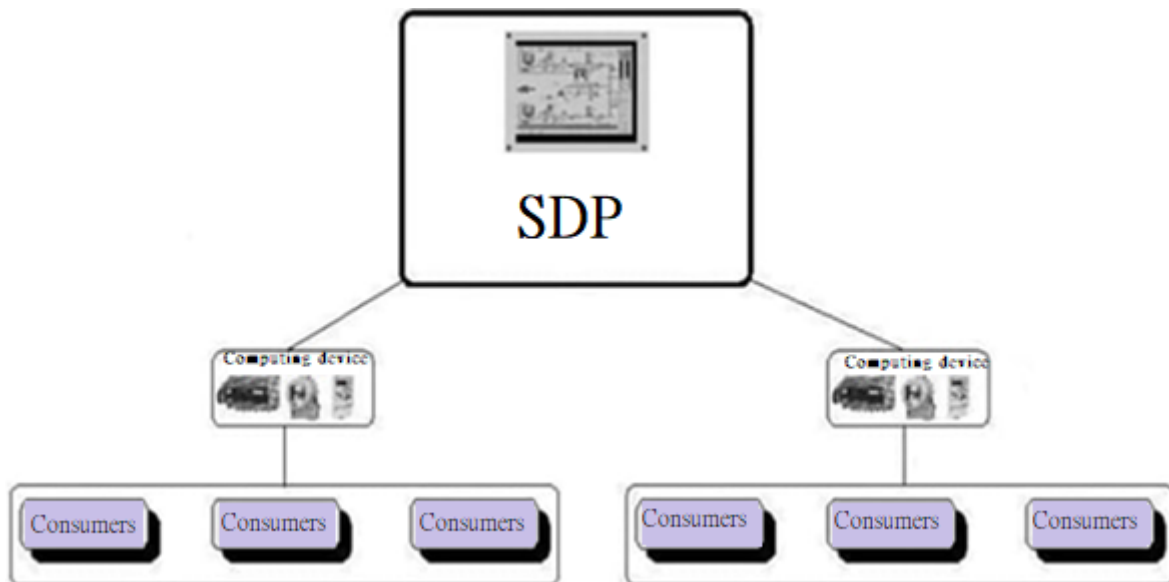


Fig 2: Dispatching control system of the power supply system.

In cases where the distance between dispatching and control points is large, telemechanical devices should be used. They do not require staff on permanent duty and allow the use of a control computer.

A special function of the automated control system is to achieve the general control goal a set of tasks focused and united by a single management criterion.

A special task of an automated management system is an operation performed with the help of hardware and software, the solution of which results in a report document or one or the same type of messages to service personnel.

Telecontrol is control of the state or condition of objects by means of telemechanics. Telecontrol of enterprises is used when it allows to improve maintenance of the regime and speed up the elimination of accidents, breakdowns and deviations from normal operating modes.

Remote measurement - should provide the ability to measure the main parameters that reflect the operation of the system and allow proper management of the situation. For ABT-Elektroda telemeasurements, it is recommended to choose the following:

- tension on the main tires;
- tension on the tires of the electricity receiving point;
- current at one end of the substation line;
- total power from separate sources, etc.



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Telemasurements of current and voltage are organized on call, and power measurements are carried out cyclically throughout the day. Tele-measurements of integral parameters make it possible to draw up energy balances. In addition, they are used to continuously enter measurement results into a computer information network.

Telesignaling - receiving information about the status of monitored and controlled objects with a number of possible discrete states. Telesignaling should ensure transmission of warnings and signals to the control panel, as well as display the status of the main elements of the ETT at the control panel, while the following indicators should be provided. :

- status of all remotely controlled objects;
- condition of large TV receivers;
- sectional bus connection and status of monitoring switches;
- the condition of the power transformers in the shop.

In addition, they are used to continuously enter measurement results into a computer information network.

Telemechanization (TM) should ensure:

- display of statuses and main elements on the control panel;
- transmission of warning and emergency signals to the control panel;
- management of the main elements of the system, etc.

Multi-channel telemechanical devices with collapsible wire are used as technical means of TM. Standard measuring current transformers with 1A or 5A output current and 100 V measuring voltage transformers, as well as sensors for collecting various technical data are used as primary measuring equipment in ETT.

In connection with the constant increase in the price of consumed electricity and the need to modernize production facilities (and their automation systems), there was a need to create complex solutions in industrial enterprises, to develop an automated system of energy resource consumption control and accounting (EANHT).

## V. CONCLUSION AND FUTURE WORK

The future of industrial production depends on the need to control energy resources, limit and reduce their share in product costs. Solving these problems will be related to the introduction of new technologies for energy saving and enterprise management. A decisive step in this direction is the development and implementation of integrated automated dispatch management systems that include the supply of the entire industrial enterprise.

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