

Energy-saving Lighting Technology of Petrochemical Enterprises

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Abstract. The shortage of energy resources is a serious problem our country is facing the world today, petrochemical enterprises are the main pillar of our economy, in our country, because petrochemical companies accounted for about 30.2% of the total energy consumption of energy. This paper focuses on the traditional energy-saving lighting methods proposed intelligent energy-saving system based on a fuzzy control. The purpose is to make the electrical equipment to fully meet, under the premise of improving its functional requirements, as far as possible to reduce energy consumption and improve energy efficiency.

Introduction

With the social and economic development, "energy conservation, green development" have become the basis of sustainable development of enterprises. Domestic and world major petrochemical warehousing enterprises are fully aware of the importance of "energy conservation, green development", to carry out a lot of innovation and research work, and steadily promote green storage building. As we all know, energy conservation from various social aspects, present, China is in a lot of consumption of natural resources and raw materials to support the rapid economic growth of the industrial era, the role of energy constraint on economic growth has begun to appear, energy

conservation has become related to our national economy event[1]. Modern petrochemical enterprises widely used transformer, air conditioning, electric motors, lighting and other energy-consuming systems, petrochemical enterprises, as China is an important energy source for its energy-saving methods and energy-saving measures, studies have is urgent. In recent years, power saving technologies that are widely used at home and abroad, formed a series of unique technical system. Through the building's cooling systems, air conditioning systems, ventilation system, power supply and distribution systems, drainage systems, elevators, lighting and other electrical and mechanical equipment for real-time monitoring and optimize the management, improve equipment utilization and management level, so equipment is always in the best operating condition, it reduces unnecessary waste, so as to achieve effective energy saving purposes. Electrical energy and petrochemical companies can choose from a transformer, power supply and distribution system and circuit design, system power factor improvement and take measures many aspects of energy saving lighting, energy-saving motors, energy-saving low-voltage electrical appliances selection, etc., its effective, science The control and management to minimize energy consumption, improve energy efficiency, this paper analyzes some of the design of energy-efficient electrical lighting and common technical measures.

Electric lighting energy method

At present, China's lighting electricity consumption accounts for about 1/6 of the total electricity consumption. Improve the energy efficiency of the lighting system will undoubtedly more significant reduction in lighting energy consumption, effectively ease the tight power supply situation[2]. Ministry of Construction of energy-efficient lighting design requirements is to ensure the work surface without reducing visual requirements, under the premise of not reducing the

quality of lighting, the use of electrical energy, such as solar energy, and strive to minimize energy loss in the lighting system. Architectural lighting large and wide range, it is great potential for energy saving lighting. Related technical parameters illuminance, color temperature, color rendering index and other factors should be energy-saving lighting key consideration. Energy-saving principles of modern electrical lighting equipment is the regulator dimming method, according to its working principle can be divided into auto-voltage dimming, cycle control regulator, PWM control frequency voltage, bidirectional thyristor phase-shift trigger Surge of several categories :

(1) The auto-voltage dimming

Its working principle is: the use of auto-transformer, according to the size of the input primary side voltage, change the connection coupled coils by changing the transformer tap is not fixed, so that the voltage drop (low-speed divided into different files 5V, 10V, 20V, etc. bit), and then made the purpose of saving energy.

This method is simple structure high reliability, easy to implement, it is possible that the output voltage has a complete sine wave, reduce the impact of harmonics[3]. However, this method is also flawed, first, since the secondary side of the tap position fixed, so that the transformer ratio is fixed, only a predetermined voltage (5V, 10V, 20V, etc.), when the primary side of the grid voltage fluctuations occur When the voltage modulation means also issued severe fluctuations, which makes lighting equipment in an unstable state, the voltage change is not only back and forth will cause energy waste, it will shorten lamp life, but also increases security risks; when voltage is too high or too low are not well based on the actual situation, to achieve the most reasonable is to use lamps, resulting in control stiff, not suitable for everyday life.

(2) The cycle control regulator

The controller is mainly used in industrial heating cycle, through the use of a combination of a thyristor controller, the entire period T , control thyristors ON, OFF voltage and turn on and off several waveforms several waveforms, by changing the entire cycle thyristor proportion, thus changing the rms ac voltage at the load lamps, and then change the brightness of the lamp to achieve dimming purposes. Adjusting the waveform cycle controller shown in Figure 1.

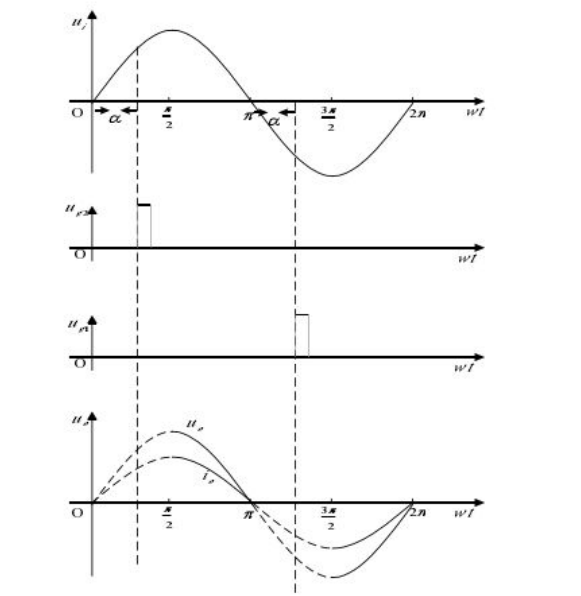


Figure 1 Cycle control method

However, the frequency cycle controller needs requirements will be high, under ordinary circumstances, the power frequency is not high, poor dimming effect, will be accompanied by the lights flicker.

(3) PWM control frequency regulator

Using a variety of full-controlled power electronic devices (such as a MOSFET FET, IGBT etc.) to establish DC / AC / DC inverter circuit, increased power frequency, and then use the controller to implement control thyristor zero trigger, this control method can reduce to some extent interfering harmonic but its cost is too high, it does not apply to high-power high-frequency power, too

difficult to achieve. Microprocessor chip high frequency PWM control waveform applied to the dimmer IGBT power switches, by generating an adjustable amplitude sine wave to drive the load lamps. Since the dimmer working in high frequencies, not only can reduce the noise and can ensure the reduction of the size of the filter element is missed[4]. In the non-linear load, sine wave dimmers can have excellent control performance, there is no limit for low load power, but when you add a circuit protection circuit itself is more convenient, easy to maintain, but the current sine wave dimmers costs too, it is not practical for everyday life.

(4) bidirectional thyristor phase-shift trigger Surge

Since the invention becomes thyristor power electronics industry has made a great contribution, now widely used in the aspects of power controlled rectifier, high-frequency control, high-power AC voltage regulator and high-voltage motor soft starting, etc., as shown in Figure 2 shows, the microcontroller by changing the conduction angle control thyristor AC sine wave input to subtract, so that the average final output voltage is reduced, so as to achieve the purpose of the control voltage magnitude, and this voltage regulator adjustment method the range is wide, itself thyristor consumption is relatively low, the overall energy-saving efficiency is relatively high, while the circuit itself is not complicated, the cost is not too high, easy specific implementation, control accuracy and stability of this method are better, It could eventually achieve continuous, gentle regulated voltage.

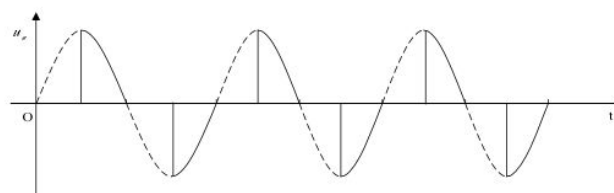


Figure 2 TRIAC phase shift dimming

However, the disadvantage of this method of regulating the output voltage is not a continuous sine wave, it will form the normal operation of high-order harmonic interference grid, this method will cause the entire power system harmonic pollution, which caused great harm and not by the usual method of shunt capacitance compensation circuit generates harmonic pollution.

For a variety of voltage regulation by relatively light above methods, different approaches each have their advantages and disadvantages can not be used alone to achieve good results, there is insufficient. Thyristor Surge for phase shift control method can accurately control signals microcontroller output thyristor conduction angle, thus changing the average value of the output voltage, so that the output voltage is ready to meet the lighting power voltage optimal value, but since the output voltage sine wave is not complete, this will cause the power grid harmonic pollution. For the auto-transformer, the inductance by changing the ratio of the number of turns to change the size of the output voltage, the input sine wave output is complete, does not generate harmonic pollution, but the voltage change is very stiff, the size of the output voltage only a fixed number of values, not continuous transformation, not suitable for our energy research. Now, through the advantages of combining these two methods complement each other, to find a reasonable regulator dimming method, so as to achieve the ultimate purpose of the electrical energy.

Intelligent energy-saving method

Based on fuzzy control theory, imagine an intelligent regulator dimming energy saving methods, the use of SCM control the entire system, the integrated signal acquisition, whether the input signal, the communication control signal and the output of the system is equal to one, the purpose is to gather input signal intelligent regulator dimming system to independent judgment, change the lamp illumination control, optimal control, and ultimately save energy[5]. This energy-saving lighting

system is a closed loop control system, the specific structure shown in Figure 3, where V is the voltage output of the feedback value, the entire system is running under, V with the running and changing energy-saving system, through continuous output constantly adjusting the voltage, and ultimately make lamps run at a saving mode.

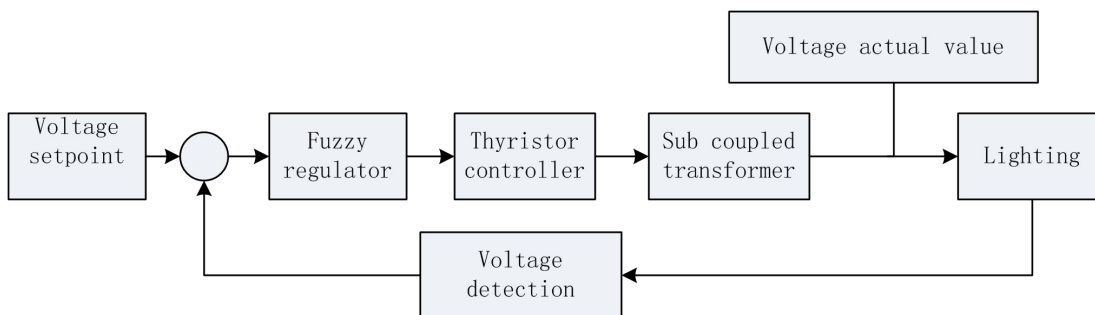


Figure 3 Energy-saving lighting system structure diagram

This regulator saving system combines dimming thyristor control and auto-transformers, but the thought of fuzzy control is applied which, combined with each other down, overcome the disadvantages of using a single control method for adjusting pressure generated, and there are these aspects of advantages:

- (1) To protect the light source device, extend lamp life more reasonable voltage and current can greatly extend the service life of lamps, lighting fixtures extended life can reduce operating and maintenance costs, intelligent lighting system can provide the best stability lighting voltage, on average, two to three times to extend lamp life and reduce input costs, reduce unnecessary energy waste.
- (2) Be able to save electricity, improve power stability. Intelligent regulator means can according to the actual situation at the scene, reasonable regulation voltage fluctuations, voltage is too high or too low will not produce the phenomenon, ensure the lamp voltage is always within a reasonable

area, and enhance the stability of the electricity, this is to protect the life of the lamp can also save energy.

(3) The reliability, security. Intelligent regulating device is divided into manual and automatic mode, set the voltage leakage protection devices, adding bypass operation means to increase power supply reliability of the lighting system, the regulator in the integration of the principle of fuzzy control theory, can improve fault tolerance, prevent malfunction, increase reliability, the regulator device itself does not contain a large exchanges and contacts and a lot of electric shock device, to ensure that the means low energy consumption and high security.

Conclusion

The use of fuzzy control algorithm, the size of the real-time voltage detection output to changes in the value and rate of change in the voltage of the input voltage, output voltage control its size. By using fuzzy control, the response speed of the system can be made more gradually accelerate and reduce the system overshoot, can change under different circumstances, allows the system to more quickly reach optimal lighting for the mathematical model is not clear under the circumstances, the use of fuzzy control thought, conducive to achieving the purpose of energy-saving lighting systems.

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