

Energy-saving Technology Application in Building Water Supply and Drainage Construction

Xuemei Guo*

Inner Mongolia Technical College of Construction, Hohhot, 010050, China

Abstract: Under the increasing demands as well as resource shortages in today's society, energy-saving technologies in building water supply and drainage construction plays a vital role. Through the rational application of energy-saving technologies, energy consumption in water supply and drainage projects can be significantly minimized and wastage of water resources can be reduced. This will play a very promising role in promoting sustainable development of resources and environmental conservation in the modern era. This paper analyzes the application of energy-saving technology in building water supply and drainage construction, with an aspiration to make energy-saving technology more reasonable in today's building water supply and drainage projects and to improve the quality of water supply and drainage construction projects, while achieving effective environmental protection.

Keywords: Construction engineering, Water supply and drainage construction, Energy-saving technology, Application

Publication date: November, 2019

Publication online: 31 November, 2019

Corresponding author: Xuemei Guo, guoxuemei041224@sina.com

1 Introduction

In today's economic era, urbanization is accelerating and construction projects are developing steadily. For construction projects, water supply and drainage construction is a vital part. Applying energy-saving technology to the construction of building water supply and drainage can provide effective technical support for the improvement of building water supply and

drainage construction quality and energy saving effect. This paper analyzes the construction status of building water supply and drainage and the problems existing in the construction, and studies the application of energy-saving technology.

2 Analysis the construction status of building water supply and drainage

2.1 Analysis of the status quo of water supply construction

With the rapid development of the city, the construction level of factories, houses and various public projects has been increasing, but most of the water supply systems are behind the buildings. Therefore, in order to meet the water demand of today's society, the pressurized equipment of water pump, variable frequency water supply equipment and pneumatic water supply equipment has begun to be widely used. However, because of the long-term disrepair of water supply equipment, many lines and pipelines have appeared. The phenomenon of aging, especially the old metal pipelines, has shown obvious deficiencies in the pressure bearing capacity^[1]. Such a situation leads to the fact that some pipelines are prone to water leakage under high pressure conditions, which brings great inconvenience to the construction of the water supply system of the building, and also causes a waste of a large amount of resources.

2.2 Analysis of current situation of drainage construction

The development of social economy has promoted the improvement of people's living standards. This has led to the development of sanitary ware in a quiet, energy-

saving and comfortable direction. In recent years, the emergence of various new sanitary equipment has made people's lives more convenient and comfortable, but the application of these devices has led to a large amount of water wastage^[2]. In today's drainage construction, ventilation technology is usually used to dissipate gas in order to ensure noise free and sleek drainage, but application of this technology also may lead to a large amount of resources wastage^[3].

3 Analysis of problems existing in the construction of water supply and drainage

3.1 Problems with the building water supply system

From the above analysis it is found that at present, most of the problems in China's water supply and drainage network are caused by water leakage and by over pressure^[4]. Through the relevant research results in recent years, it is found that in China's water supply and drainage system, the water leakage caused by the excessive pressure of the water supply system will lead to a waste of a large amount of water resources. At the same time, it will bring greater economic losses to the water supply and drainage project. For construction projects, water supply engineering is a hidden project. If there is local leakage it can only be discovered if the leaking part is exposed outside, otherwise it will be difficult to find it on time^[5]. In addition, because the project is relatively concealed the maintenance also requires higher costs, and even affects the operation of other processes resulting in greater losses.

3.2 Problems with the construction drainage system

Among the building drainage systems, the most important problem is the leakage. Through relevant research, it is found that the leakage of the drainage system is mainly due to the leakage of pipelines and other equipment in the system, and the causes of leakage of the drainage pipeline are listed as follows:

Table 1. Causes of leakage of drainage pipes

Leakage problem	Reason
Leakage of pipelines and other equipment in the system	Unreasonable design
	Poor pipe quality
	Improper maintenance

4 Analysis of water-saving technology application in construction water supply and drainage construction

4.1 Application of vacuum water saving technology in construction water supply and drainage construction

In the construction of water supply and drainage system, the application of vacuum water-saving technology is mainly to establish save water by means of drainage technology. The principle of this system is to press enough air into the vacuum negative pressure equipment. It is fully integrated with water resources, thus forming a non-potable water resource that can be utilized^[6]. The components of the vacuum water-saving system mainly include vacuum valves, water suction equipment, sealed pipes, vacuum collectors and circulating pumps^[7]. In the construction and drainage of buildings in the modern era, vacuum water-saving equipment has been widely used, and the water-saving effect has been significantly improved. The main application areas are flushing, cleaning of sanitary ware and irrigation.

4.2 Application of water reuses technology in construction water supply and drainage construction

Reclaimed water is the water produced by the treatment of sewage or rainwater using filtration and disinfection techniques. Although water cannot be used as drinking water, it can be used as water for construction, irrigation, flushing, and floor cleaning.

Table 2. Analysis of water treatment methods

Approach	Content
Physical processing (filter membrane method)	Let the solution be separated by external force and flow along the filter at a certain speed. The solvent, low molecular weight substance and inorganic ions pass through the filter from the high pressure side to the low pressure side. Then, it is discharged as a filtrate; the ultrafiltration membrane intercepts the polymer substance, colloidal particles, and microorganisms, and the solution is discharged in a concentrated form.
Physical chemistry	Applicable in case of large variation in sewage quality. There are mainly activated carbon adsorption method, sand filtration method, coagulation sedimentation method and flotation method. The solution is processed by a hollow fiber ultra-filter, which has advanced technology as well as compact, has a less footprint, the system can be operated indirectly, and the system management is also very simple.

Biological treatment	It is suitable for use in sewage treatment with high organic content. Commonly used methods include contact oxidation, activated sludge, and biological turntable. It can be used alone or in combinations. It has strong adaptability to changes in hydraulic load, produces less sludge, and is more convenient for maintenance and management.
----------------------	---

5 The application of energy-saving technology in the construction of water supply and drainage

5.1 Application of municipal water pump network pressure

Under normal circumstances, in water supply and drainage construction of high-rise buildings, the problem of insufficient pressure on the municipal pipe network can be dealt with by the pressurized water supply technology. The application of the pressure technology of the municipal water pump network is mainly to install the water inlet device in the storage tank. Then use a booster pump to pressurize the water supply[8]. In order to ensure the safety of the water supply, some water supply companies usually have to give up the water pressure, but this will increase the consumption of electricity. For this problem, in the design of the building water supply and drainage system, the actual pressure situation of the municipal pipe network should be fully considered and apply partition management strategy to local conditions. In general, water applied to the top floors of the building required to apply pressure, and the municipal pipe network should directly supply water to the floors at the bottom of the building[9]. In the process of designing, an alternative solution can be provided through the opening of the valve to the water tank or the pressurised water supply, thereby achieving a significant improvement in the energy-saving capacity of the high-rise building water supply and drainage.

5.2 Application of variable frequency speed control water pump

In water supply and drainage construction of today's buildings, the most common water supply method is the hybrid of water tank with water pump. The water level of the water tank is raised to a certain height by using water pump, and then the water supply is carried out downwards. With the decompression device, the power supply of the pump can be frequently turned off, so that the overpressure of the water point can be

avoided, but the frequent switching pump will waste power^[10]. Therefore, the application of the variable frequency speed control water pump can not only solve the problem of water point overpressure, but also saves energy. The application of the variable frequency speed control water pump is mainly to feedback and adjust the speed of the water pump through the standard of water quantity, so the frequency of switching of water pump can be effectively reduced, and the power consumption can be significantly low. The application of variable frequency speed control pumps can also effectively reduce the cost of water tank and tank investment.

Table 3. Features of the frequency conversion speed control pump

Characteristics	Content
Water saving	The actual pressure can be used to set the pressure of the pipe network, and the water output can be automatically controlled to reduce the leakage of running water.
Energy saving	Maximize energy-saving operation through optimization of energy-saving software.
Reliable operation	By controlling the soft start of the water pump through the frequency converter, it can switch from power frequency to frequency conversion without any impact, avoiding excessive pressure of the pipe network, pipe network impact and pipe rupture.
Flexible control	It can be used for water supply, water supply in sections, or manual work.
Self-protection	In the event of a pump failure, an alarm message can be automatically issued and the standby pump can be automatically started.

5.3 Separation of the living water supply system and the consumption water supply system

Living water supply and consumption water supply have different requirements. Usually, the pressure of living water supply can be between 300 kPa and 400 kPa, while the pressure of consumption water supply might exceed 800 k Pa. Therefore, during the construction of water supply and drainage, if the living water supply and the consumption water supply system can be separated from each other, the two can operate in opposition. The damage to the water supply equipment can greatly be reduced, also it can further reduce the construction cost of building water supply and drainage, and effectively meet people's water demand^[11].

5.4 Reasonable choice of water source and water supply system

In the construction of water supply and drainage projects, the choice of water source and the choice of

water supply system will directly impact the energy-saving capacity of water supply and drainage projects. Therefore, when the vertical division of the water supply system is made, comprehensive consideration should be given to the number of layers of the building, its usage, the consumption of electric energy, and the demand for water supply. Under normal circumstances, in the water supply and drainage construction of buildings below 100 meters, vertical partitioning and parallel connection can be used for water supply. In the water supply and drainage construction of buildings over 100 meters, vertical partitioning can be used for water supply. In addition, in the selection of decompression and pressure control measures, it must be determined according to the actual situation of the project, in order to effectively avoid the occurrence of overpressure outflow, and thus achieve good energy saving effect.

6 Conclusion

In summary, the building water supply and drainage system is closely related to people's day to day life. The humanized design of the building water supply and drainage system will ensure people's quality of life and water demand are well protected. However, due to the increasing problems of resource scarcity and environmental pollution, in the process of building water supply and drainage construction. Not only the needs of residents' comfort and economy to be fully considered, but also the energy-saving effect. In the construction process, the application of technology and equipment should be based on energy conservation. In this way, the energy-saving effect of the building water supply and drainage project can be further improved, and the sustainable development goals of energy and environment in today's society can be realized.

References

- [1] Liu SW. Application Research on Water Saving and Energy Saving Technology in Building Water Supply and Drainage Design and Construction[J]. *Green Building Materials*, 2018(4).
- [2] Mao PZ. Application of Water Saving and Energy Saving Technology in Building Water Supply and Drainage Design and Construction[J]. *Construction Materials and Decoration*, 2017(1).
- [3] Li QJ. Application of Water-saving Energy-saving Technical Standards in Building Water Supply and Drainage Design and Construction[J]. *China Standardization*, 2017(18).
- [4] Liu W, Du CH. A Brief Analysis of Energy Saving and Emission Reduction Measures in Construction Water Supply and Drainage Engineering[J]. *China Science and Technology Investment*, 2017(30).
- [5] Zhang MH. Application of Green Building and Energy Saving Technology in Electromechanical Installation Engineering [J]. *Building Construction*, 2018(6).
- [6] Lao ZP. Application Analysis of Water Saving and Energy Saving Technology in Building Water Supply and Drainage Design and Construction[J]. *Building Materials and Decoration*, 2018(15):13-4.
- [7] Shang XN. Research on the Application of Energy Saving Technology in Water Supply and Drainage Construction of Civil Buildings[J]. *Construction Materials and Decoration*, 2017(52):11-2.
- [8] Zhang XY. Discussion on the Application of Water Saving and Energy Saving Technology in Building Water Supply and Drainage Construction[J]. *Farmer Adviser*, 2017(16):175.
- [9] Gao Y. Analysis of the application of energy-saving technology in building water supply and drainage engineering[J]. *Green building materials*, 2019, 147(05):33+36.
- [10] Li YN. Discussion on the application of water saving and energy saving technology in construction water supply and drainage construction[J]. *China Equipment Engineering*, 2018, 404(19):227-8.
- [11] Xie H. Application of Energy Saving and Emission Reduction Strategy in Building Water Supply and Drainage Engineering Based on Low Carbon Concept[J]. *Sichuan Cement*, 2018(9):112.