Research Status and Significance of Emergency Disposal Decision-making for Urban Water Supply Pipe Network

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Abstract. Urban water supply is the lifeline of urban survival and development, is an important constraint of sustainable urban development and construction. Water pipes accident often occurs, emergency treatment isn't timely, seriously affect people's lives, restricts economic development. This study researches common problems that many researchers relate to research. First, discuss of the research status on the basis of accessing to an extensive literature; second, summarize the main problems in the current domestic and international research; then point out the significance of the emergency decision of the urban water supply network of the urban's economic construction and social development; finally, research the current hot topic. Using this article research result, research can save a lot of time to direct the selection of studies, research work has a good role in promoting.

Introduction

Urban water supply is the lifeline of urban survival and development, is an important constraint of sustainable urban development and construction, protect people's lives and development of production indispensable material base, is directly related to social stability and economic development. In order to ensure accordance of the urban's construction and development, coordination with the social and economic development, urban water supply system adapt to the people's living standards continue to improvement, must effective protection of the urban water supply security. Current, establish and improve a rapid and effective response in the day-to-day supervision of urban water supply mechanism and emergency mechanism is a new topic for all levels of government to be solved. The water supply network is an important part of the water supply system, the pipe network system is hidden, scattered, difficult to manage, and the current mode of China's urban water supply network management are more traditional, backward. To this end, the emphasis on improving the traditional management concepts and management of content, new management techniques and management models, network management theories, methods and means of innovation, intelligent direction. With the accelerated process of urbanization, as well as the continuous improvement of people's living standards, the requirements of the urban water supply, which requires the urban water supply enterprises to continuously improve the management level. Many researchers during the emergency response decision-making of urban water supply networks, Research, analyze and identify problems to be solved, and then determine the research. Using this article research result, research can save a lot of time to direct the selection of studies, research work has a good role in promoting.

Foreign Research Status

From the beginning in the 1950s, computer technology use to industrial water supply in abroad,

urban water supply scheduling problem start to research and exploration in the 1960s [1-3].Usually the pressure and flow of the control point in the pipe network using remote sensing equipment, the actual operating parameters of pressure and flow of water plant clear water tank and water tower water level is automatically transferred to the water supply center control room, as a basis for optimal scheduling of dispatch personnel. Optimize the scheduling software run the optimization of decision-making so as to implement the optimal scheduling. At present, United States, Britain, Japan, France and other countries, some of the basic urban water supply system of the computer to optimize the scheduling management, and form some of the more common scheduling management software, like the UK GINAS and the United States of OPWAD. Optimization theories and methods in urban water supply is running, Ali Keyhani, the Lindell E.Ormabee, Mark T. Yin release the latest research results in recent years. Among them, Vilas Nitivattananon propose restrictions on the pipe network water load, water pumps, water supply urban and other geographical factors, the water supply network to optimize the scheduling model become a number of sub-models were studied at different time periods and regional, and gradually optimized method for solving the optimal scheduling of dynamic programming model. Lindell E.Ormabee review the water supply pipe network optimization involved in the scheduling process all types of pipe network hydraulic model, the load forecasting models and optimal scheduling model over the years, research the characteristics of the pipe network hydraulic model of the pipe network and optimization methods.

In foreign countries, the emergency decision technology applied in water supply network research isn't much, but in the overall assessment and monitoring, emergency rescue, emergency command coordination and planning response has been widely applied [4-8]. Since the launch of high technology and high risk features, the United States NASA has used the emergency decision system, such as the use of GIS basic information resources, to provide decision support for emergency decision. In August,1997, the United States Department of energy to ensure that the Saturn detector Cassirti is successfully launched, the establishment of emergency response teams to help launch. The panel includes radiation monitoring and assessment, communication and logistics support, emergency response topography analysis system and other aspects of personnel. Emergency response topography analysis system using Arc/Info and ArcView software to complete the emergency required spatial geographic information and analysis. On the other hand, foreign to the emergency rescue of more. For example, the United States Federal Emergency Administration of the use of Federal Emergency Management Information System (FEMIS),is used to assist in emergency command of emergency planning, coordination, and training response. FEMIS is using the traditional C/S model, including the man-machine interface, a relational database management system (RDBMS), e-mail system, report generation system, plan management system, GIS system and toxic substances harmful to model and analysis tool, complete the user oriented decision support functions, can realize the emergency plan, rescue association and the emergency management and other functions.

Domestic Research Status

Tianjin university, professor Zhang Shiying and Zhang Hongwei research on the water supply pipe network and its decision support are more representative in China. Professor Zhang Shiying has a breakdown state of urban water supply network scheduling decision support system research the research content mainly includes: using neural network method, BP neural network to establish the accident hourly water demand forecast model; determinate the network normal operation state and fault running state of the relationship; combine network normal operation and accident operating conditions two state of this relation, Establishment network accident running state macro model; choose a suitable algorithm to solve the model; based on the above ideas, respectively, prepare prediction of water pipe network adjustment, macro model, optimization model and computer program. Professor Zhang Hongwei assumes a urban water supply pipeline leakage and optimization of urban water supply, maintenance decision support system research projects of National Natural Science Foundation. In the decision support system, based on the decision support

system and the project urban short-term water demand prediction, network operation state simulation and optimization scheduling model and its solving method research, using systems engineering, engineering management and information system engineering theory and method, combine with professional knowledge have been studied systematically [9-14].

There are also many scholars through the GIS pipe network decision-making system. In Hunan university, professor Xu Renrong research the decision-making system in the GIS environment, water supply network failure. Optimal scheduling notice to the affect the user in advance to prepare well without water, avoid greater impact; the guidance of the valve arrangement, in order to avoid the accident, causing widespread disruption of water supply region; pumps and hydraulic condition analysis, scheduling the running of the station crew to play a guiding role in some areas because of high pressure pipe network to avoid off valve again burst pipe. In Chongqing university, professor Long Tengrui, and He Qiang research the maintenance decision-making system based on GIS in urban sewage pipe network monitoring, inspect and maintain to provide decision support, in Sichuan Yuechi, east area of Yuechi urban sewage pipeline as an example, develop urban sewage pipe network monitoring and maintenance decision-making system software, dynamic monitoring of the health status of urban sewage pipe network system is running and to provide the best maintenance program [15-17].

Domestic research more representative: Beijing university of aeronautics and astronautics's professor Zou Zhihong, research accident warning of a significant loss of water supply network simulation principles and methods; in Chongqing jiaotong university, professor Zhang Furen, research gas pipe leak location theory and dangerous assessment systems; in Chongqing university, professor Yang Jin and Huang Xiaomei, respectively research the water supply pipe network leak detection positioning information analysis and processing of urban gas network quantitative risk evaluation system and a number of key technologies; in Xi'an architectural science and technology university, professor Huang Tinglin research the urban water supply networks sudden emergency treatment management system; in Tongji university, professor Xin Kunlun and Liu Wei research the water supply network based on dynamic information feedback pollution emergency response strategy, based on the automatic generation of the lifeline topology work system seismic topology optimization; in Tianjin University, Le professor Jin Shiyou, Tian Yimeii, Zhao Xinhua, research new methods and key technologies of the fluid pipe network leak detection, prediction and warning pipe explosion of urban water supply networks, urban water supply dynamic simulation of the network reliability and related technologies.

Present Research Problems

Present research problems mainly in the following points:

(1) Research content disperse and no comprehensive. Throughout the domestic and foreign research data, the urban water supply pipe network, dispatch decision-making, geographic information system, tube processing, intelligent decision, emergency treatment and other aspects have been studied in detail, but the urban water supply pipe network emergency intelligence decision comprehensive research method and theory are less.

(2) Research focus on the macro model. Macro model of the pipe network statistics for the analysis, in terms of computational accuracy, credibility of, or in the actual working conditions change adaptation, more can not meet the water supply pipe emergency treatment on the reliability, security the requirements of the economy and other aspects. The rapid development of computer technology, intelligent decision-making for emergency treatment of research and application of the premise.

(3) Lack of prediction of water supply network for major sudden incidents. Domestic experts and scholars are in the process the study of urban water supply network burst prediction and warning, but there are no outstanding scientific research. Other accidents is the lack of forecast and early warning mechanisms. Most of the water companies are convened by the persons concerned after the accident, access to the drawings, a meeting to study the development of treatment programs, delays in repair time, may cause great losses.

(4) Emergency treatment research more on the tube rupture, but research less on other emergency. Burst pipes only need one aspect of the emergency treatment, many also do emergency treatment, in order to ensure the security of water supply.

Research Significance

Present research problems mainly in the following points:

The safe operation of the water supply network is an important link to ensure that urban safe water supply, is a popular works which involve in the thousands of families and creation civilized urban, is also an important manifestation of building a harmonious society and ensure social stability. Therefore well-developed contingency processing system improve the processing pipe network capability to respond effectively organize human and material resources in the pipe network is an accident in a timely manner, and earnestly do a good job all the more urgent and important repair work of water supply network. The speed of response to emergencies and decision-making processing capability is an important symbol of urban modernization, is also the most important indicators to measure the effectiveness of emergency management. China's urban population are still growing, emergencies facing challenges relate to the national economy and the urban water supply network security becomes extremely important. This research in connection with the characteristics of modern urban, the formation of a complete urban operation management system, improve prevention and deal with the emergency capability of the water supply network, have a creative breakthrough from technical level and management level. research significance highlight the following point

(1) Protection the urban people's living. Water is the source of life, is the basis of human survival and development. With the continuous development of economy, standard of living of urban residents than ever are substantially improving, but water pipe network supply accident cause much inconvenience to the residents, make a direct impact on the quality of the residents. Requirements are still far from the security of water supply and water quality and the masses. Emergency response smart decision-making system, improve the early warning of emergencies water supply pipe network, prediction, forecasting and on-site emergency handling capability to fully meet the domestic water needs of urban people step by step out of the new way to a safe water supply, quality service to the scientific development.

(2) Promotion urban economic development. The water supply system is an important part of the urban system, is directly related to the survival and development of the urban. China is a water-scarce country, water supply capability growth lags behind growth in demand, supply and demand contradiction, the grim situation of water resources has become a restricting urban socio-economic development, urban environment to improve the normal functioning of the urban. Many urban make the water supply system planning, operation, regulation and management issues as an important strategy to support sustainable socio-economic development, this research is an important part of the strategy.

(3) Conducive to building water-saving urban. With the development of economy and the acceleration of the process of urban, urban water shortage degree is more and more serious. In recent years, many urban create a water-saving type as the goal, develope urban water conservation activities, obtain a certain result for the urban construction of water-saving urban. But along with the old urban's water supply pipe network has become more and more serious, water supply pipe network accidents, cause a large amount of waste of water resources. Using the research results in this paper, take effective measures, accelerate technical reformation of urban water supply pipe network, reduce the leakage rate of pipe network and the accident rate, develop network transformation plan, construction of water-saving urban is one of the effective ways.

(4) Improving the urban image, taste and open strategy. The water supply pipe network make urban environment degradation, adverse impact to the urban, directly affect the urban's image and taste. With the acceleration pace of many urban, building an international metropolis and investment, investors not only to pursue the maximum profit, capital increasing the value and prefer

to work in a comfortable environment and raw. There is no doubt that the water crisis since then the impact of opening up of the urban and urban quality and image.

(5) Improving the level of urban information. To ensure the urban running the core is the use of modern information technology to build highly integrated capabilities of the urban run. In accordance with the laws of urban development, strengthen the urban running a variety of real-time monitoring, early warning and rapid response, co-processing, the application of information technology is the best choice. This project as an important part of the urban operation in the protection of urban water supply ,at the same time, research and application of the urban heating pipe network, urban gas pipe network, urban sewage pipe network has a very important reference value to improve the urban informatization in the level of significance.

(6) Strengthen urban operation management. The incident is running a large extent pre-control in the city, and thus identify with the relevant incentives and ask the pre-control measures, is a key part of the city run work. Intelligent decision support system is essentially adjuvant to achieve a high degree of data sharing and value-added services of water supply network, making the urban water supply management to the decision sciences and flexible command, timely response, rapid response and efficiency in the use of management resources and public resources service levels have been greatly improved, and will also play an important role in promoting the coordinated and sustainable development of economy and society.

(7) Playing an full important role of the emergency plan. Emergency program plays a key role in the emergency response system, clear and just end after the accident, who is responsible to do what, when, and the corresponding strategies and resources to prepare for. The severity of the occurrence of major accidents and their consequences, make detail arrangements for the various aspects of emergency preparedness and emergency response is a guide to action to carry out emergency rescue work. Through the preparation of contingency plans to guide the emergency response work, and when the event of a major accident over emergency response capabilities, facilitate coordination and superior emergency services, improve awareness of risk prevention.

Conclusion

Water supply pipe network of information technology lags behind at present, convene meeting of the relevant personnel research and treatment programs after the accident, passive emergency handling, decision-making method is backward and isn't scientific.Through the above analysis can see that intelligent decision support system is the future direction of development. Current research in intelligent decision support mainly in the following three hot issues: (1) fuzzy decision theory and application. Fuzzy decision-making is an important part of the fuzzy theory is the mathematical theory and methods of research in fuzzy environment, or decision-making in a fuzzy system. Multi-objective fuzzy decision better able to handle multi-objective, multi-factor, fuzzy and avoid subjective factors, such as. Suitable for starting a fuzzy decision theory to study the characteristics of uncertainty, data and indicators for urban water supply pipe Wang Shi. (2) Developing contingency plans. Well-developed emergency response programs to improve the pipe network process capacity to respond is an urgent need to deal with them when the accident occurred. The formulation of contingency plans, including: according to the classification of the impact factors of the accident; according to the classification of the situation, determine the organization's members and their responsibilities, determine the emergency procedures; and taken for the safety of the site control procedures and safeguards. (3) Accident Prediction of early warning methods. In the qualitative analysis of water supply pipes on the basis of accident mechanism and influencing factors, summed up the law of accident, the establishment of a water supply pipe Wang Shi risk assessment model. Establishment of maintenance decision model, thus the decision whether to maintain, and take the kind of maintenance program. The use of potential accidents model of evaluation and maintenance of decision-making model, you can reduce maintenance costs and accident damage costs. (4) The design of intelligent decision-making system. Intelligent decision support system framework, point out that the function of the system should be implemented, the model library system design; from the knowledge of relational database, knowledge base and

knowledge base management system, the inference mechanism, the true value to maintain the structure, and explain the mechanisms of research knowledge base and inference engine; database design, data manipulation class design, detailed design of the main function modules. It provides intelligent decision support system for water supply company. The formation of a complete city operation management system, prevent and deal with water supply network emergencies and the ability of great significance.

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