Research on the connotation and development trend of remote collaborative emergency technology in petroleum industry

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Abstract. Due to the particularity of raw materials and the complexity of processes, the petroleum and petrochemical industry involves a variety of disaster risks in production, transportation, storage and etc. However, there are three barriers in the emergency rescue of the petroleum and petrochemical industry, scene separation, data isolation and inefficient coordination. No matter the application of existing technology or the proposed method and concept, the situation cannot be broken quickly. By analyzing these problems existing in 5G communication technology, artificial intelligence and petroleum and petrochemical emergency rescue, this paper puts forward the concept of petroleum and petrochemical remote collaborative emergency technology, analyzes the development trend of remote collaborative emergency technology, and prospects the petroleum and petrochemical emergency rescue technology.

Keywords: Remote collaborative, Technical connotation, Development trend.

1 Introduction

At present, the emergence of new technologies such as information and communication technology and artificial intelligence has changed the original technical level and production mode in industries and other fields all over the world. 5G technology is the most advanced technology in the contemporary era. Its transmission speed is fast, and the maximum speed can reach 10Gbit / s, which is 100 times that of 4G communication technology. At the same time, it has the advantages of low network delay, and it is generally less than 1 millisecond, which is 30-70 times that of 4G. It has been popularized and applied in many fields, such as remote collaborative office, remote collaborative diagnosis, remote collaborative teaching, remote collaborative medical surgery and so on. The combination of new technology and original technology provides new ideas for the mode of industrial production, makes it undergo profound changes, and presents a trend of coordinated development of information technology and multiple technologies. The emergency disposal of accidents in the production process also needs technological innovation.

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At present, the accident emergency treatment technology shows a high-tech trend, especially the development of artificial intelligence, Internet of things and other technologies, which shows great advantages in solving the large casualties and unreasonable material allocation in the rescue process. However, the emergency rescue technology can not be completely separated from people due to the complexity of accident disposal and the defects of current rescue. Therefore, a long-distance and cooperative rescue method that can avoid risks needs to be explored.

"Remote collaboration", a new concept derived from the change of social production mode, can provide tools for the future development of accident emergency rescue. In order to better research and develop remote collaborative emergency technology, it is necessary to study the technical connotation and development trend of remote collaborative emergency technology.

2 Origin of remote collaboration technology

Long distance refers to long distance and long range. As an attribute, it is often used in combination with other nouns, such as long-distance education, long-distance shooting, remote desktop, remote cooperation, remote control, etc. Distance education originated early, and relevant records have been recorded in ancient times. The concepts of remote desktop, remote cooperation and remote control are also widely spread especially the application of computer and communication technology.

Collaboration refers to the ability to integrate various decentralized resources and make them cooperate fully to achieve common goals. It refers to the ability to collaborate and coordinate two or more goals to achieve a goal. Haken, a German physicist, put forward a unified idea of system synergetics, stating that in a system, if all subsystems or elements in the system can cooperate and cooperate well, a variety of forces can gather into a total force and form a new function that greatly exceeds the sum of their original functions.

Synergy is not a new thing whether at home or abroad. It appears with the emergence of human society and develops with the progress of human society. Collaboration at present includes not only the collaboration between people, but also the all-round collaboration between different application systems, different data resources, different terminal devices, different application scenarios, people and machines, science and technology and tradition.

There are implicit differences between coordination and cooperation. Cooperation refers to the decomposition of a production process into different processes, which are carried out by multiple people at different times, and refers to planned cooperative labor. On the basis of cooperation, coordination further emphasizes three requirements. Firstly, collaboration emphasizes the correct configuration of individuals in the system, while collaboration has no direct requirements for participating individuals. The framework of collaboration is stronger, and collaboration not only focuses on the framework of the whole, but also on the behavior of individuals to complete their work and the influence between individuals. Third, collaboration can be asynchronous. Participating individuals perform tasks and can wait for each other. Collaboration emphasizes the close cooperation of participating individuals and pays more attention to real-time. Therefore, the meaning of collaboration is broader, and collaboration is a special collaboration based on this.

3 Development of remote collaboration technology

Remote collaboration develops with the emergence of human society, which is roughly divided into four cycles, including local simple collaboration between people in the

primitive society, remote collaboration in the agricultural era, man-machine collaboration in the industrial era, and all things collaboration in the information age.

Primitive society, also known as primitive commune, is the first social form in human history. The process of human production is also the process of the formation of primitive society. It has existed for 23 million years and is the longest stage of social development in human history. The combination of labor is mainly simple cooperation, and the division of labor between people is mainly a natural division of labor according to gender and age due to the extremely low productivity. People are single and unable to struggle with nature. In order to seek living resources, they must work together, which determines the common possession of means of production. At the same time, people can only have an equal relationship of mutual assistance and cooperation in labor. Products are shared by all members of society and distributed equally. Therefore, the synergy in this era is mainly the simple collaboration between local people and people with ethnic groups as the boundary, and the collaboration between pure physical strength.

On the basis of primitive society, agricultural society developed gradually. As hunting developed into human domestication of animals, the mode of production evolved from collection to crop planting, and the development of agricultural society from the initial clan and tribe form to the emergence of cities, and finally formed a country. Human society has developed from a single direct access to natural food. Adults can use nature to produce their own material means of production, and the productivity has been rapidly improved. Not only the overall coordination between people, but also the coordination between people and things was formed during this stage.

Since the 1860s, a series of important inventions have appeared in emerging industries in Britain. Machine production has gradually replaced manual labor, and then expanded to other industries. This major change in industry, science and technology is called the industrial revolution. Machines have gradually replaced human and animal forces as the leading force of production with the development of the second technological revolution. More and more mechanical equipment have been manufactured to work for human beings, giving birth to the comprehensive cooperation between human and machinery and the prototype of simple remote cooperation such as CNC machine tools and remote-controlled cars.

Since the mid-1950s, human society has transitioned to the information age and entered the third revolutionary wave. The invention of computer gave birth to the information revolution. During this period, information technology was the main body, focusing on the creation and development of knowledge. The biggest difference between the information society of the third wave and the agricultural society and industrial society of the previous two waves is that it no longer focuses on physical and mechanical energy, but on intelligence. With the continuous development of computer, Internet, big data, cloud computing, artificial intelligence and other technologies, all things collaboration modes such as remote collaboration, remote conference, remote operation, remote education and remote surgery have been born. Collaboration scenes emerge one after another, and the concept of remote collaboration has been applied.

4 Connotation of remote collaborative emergency technology

As a new concept, remote collaboration has not been defined in academia and authoritative media. Remote collaboration itself is not an independent technology, it must have a technical carrier, such as medical surgery, teaching and so on. Therefore, remote collaboration technology is a combination technology integrating remote communication and other technologies. With the help of communication technologies such as telephone, radio and television, Internet, local and large-area networks, it constructs communication

between people, between different application systems, between different data resources, between different terminal equipment, between different application scenarios, between people and machines.

Because of its technical combination, remote collaborative emergency technology will also present different technical connotations for different emergency scenarios. Scientific and objective definition of remote collaborative emergency technology will lay a technical foundation for the research of this technology.

As an application of remote collaborative technology in the emergency field, remote collaborative emergency technology will break the space-time boundary of emergency technology and promote the efficient integration of all links in the emergency work process. Remote collaborative emergency technology is a cross space-time and efficient man-machine collaborative emergency technology integrating remote communication and intelligent emergency technology and equipment, which can realize cross space-time real-time information transmission, decision-making and command, emergency response, improve emergency work efficiency, and avoid casualties and reduce property losses.

5 Development trend of remote cooperative emergency technology

Remote collaboration has gradually penetrated into more and more technical fields with the development of technology collaboration. Despite a large number of scientific research on safety risk prevention and control, the leakage, combustion and even explosion of various hazardous chemicals and toxic and harmful materials still occur from time to time in the production process. Firefighters are the first to bear the brunt of the accident.

If there is improper command and decision-making, improper process disposal and bad accident environment during emergency disposal, firefighters will often go deep into danger and even cause personnel sacrifice. How can fire rescue personnel carry out emergency rescue and avoid being in danger? The efficient integration of emergency technology and remote coordination technology and the exploration of new ideas suitable for petroleum and petrochemical accident rescue may effectively solve the three problems existing in the emergency rescue just mentioned.

However, the development of technology is gradual. With the development and breakthrough of communication technology, artificial intelligence, Internet of things and other technologies, remote collaborative emergency technology also has obvious stage development characteristics.

Emergency technology is roughly divided into four stages, including the first stage in which emergency disposal work completely depends on human beings, the second stage in which intelligent equipment assists human beings to complete some emergency rescue work, the third stage in which human aided intelligent equipment to complete some emergency rescue work, and the forth stage in which the emergency rescue work is completely completed by intelligent equipment.

Remote collaborative emergency technology is to take remote communication technology, computer technology, remote perception and control, man-machine cooperation and other technologies as means to improve the current problems of unreasonable accident rescue, low efficiency and high casualty rate in the process of accident consequence disposal. Therefore, in the future petroleum and petrochemical emergency rescue, remote collaborative emergency technology will become the mainstream technical development direction. The remote collaborative technology system improves the command and decision-making, remote control and remote real-time operation process in the process of accident rescue. With the development of the basic technology constituting the remote collaborative technology system, the future emergency rescue will be carried out in the

direction of remote collaborative emergency. The accident and disaster detection, rescue decision-making, control and operation of on-site equipment and emergency equipment will become more intelligent with the passage of time.

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