

Study on the Evaluation Scheme of Emergency Response Capacity of The Three Gorges - Gezhouba Dam

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Abstract. according to different navigation condition and environment of traffic emergency strategy, using fuzzy algorithm to the actual situation of ship parameters of the actual situation assessment, the result will be according to the instruction from the data graph for the actual operation, effectively avoid risk. Ships that should be properly arranged in a non-emergency session should avoid the concentration of traffic in heavy traffic and cause unnecessary security risks. The general function of ship safety is established by mathematical modeling, and the application function is used to control the ship. Ensure safe navigation.

1 Introduction

Now in the rapid development of water transport industry, which is associated with a lot of economic growth and profits, and the accident, although in recent years, since the number of shipping accidents in gradually reduce, but in the future, not to establish a good set of emergency response system will probably shipping development, especially about the future a certain impact on the development of inland waterway transport.

Experience in recent years, many of the accident emergency response mechanism in China has been the universal enhancement, but emergency corresponding need further broaden the width, as a construction, shipping, transportation, inland water transport power we want in the whole reverse improve the transport ability of our country, in the process of transportation it is also necessary to ensure the safety of the ship.

While at home and abroad, the study of Marine emergency response method is relatively more, but in view of the emergency response of the inland river ships, especially of the three gorges project - gezhouba study the key areas of safety and emergency measures in China is relatively small, according to local specific situation, set a reasonable emergency response mechanism is particularly important.

As an important part of China's Yangtze river waterway, the three gorges gezhouba is strategically important in the middle reaches of the Yangtze river. However, the general situation of the three gorges area in recent years is not optimistic. The three gorges - gezhouba area is a sensitive area, and it is imperative to maintain the security here.

2 Research on underwater search and rescue capability.

2.1 requirements of divers

Divers, hard as a high-risk industry, in recent years, the faster, diving industry construction in our country, but most diver rescue in search and rescue in our country is still limited to the range of small rivers, small DAMS in our country. In the three gorges valley complex natural environment, in terms of quality, to develop a diver

- To have the very strong psychological work under pressure and ability to cope with sudden special circumstances

- The relevant departments should strengthen the diver training to improve the efficiency of the divers explored - To strengthen the construction of the diving industry and support, the diver to have a glorious, their heart of courage. Divers in addition to complete my PADI training after the success, also need to be in when the accident happened, to make the right judgment of the accident is within a few minutes to ten minutes before the rescue of the golden age, in the process of search and rescue, divers actions must be quick and efficient, this would require the relevant rescue departments timely orders and diving rescue team timely response.

In the process of search and rescue, it is necessary to form a good system of search and rescue, in the process of search and rescue, we must be on the water in the process of search and rescue, we should draw lessons from the domestic and foreign advanced underwater detection technology, and cultivate good diver rescue technology and technique. The equipment of the rescue should be equipped with the best possible weight loss, the new equipment on the new equipment more convenient and faster and more efficient.

2.2 unmanned rescue equipment

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In recent years, the development of underwater search and rescue technology in the unceasing development, search and rescue equipment is tend to be intelligent and kind, there is no search and rescue equipment is mainly unmanned aerial vehicle (UAV) for the water to search for, and for search and rescue and localization of underwater unmanned ship, no equipment of the advantages of high efficiency, the scope of the search and rescue, can undertake some divers to work, for example, a lot of unmanned underwater search and rescue equipment such as the ROV and sonar radar, one after another, now of the underwater robot can be the deepest underwater search and rescue of 6000 meters. And it can take three to six kilometers of fast walking. However, the technical research and development required on the equipment of unmanned equipment need to be further strengthened, and the maintenance of the equipment should be timely and effective.

2.3 research on underwater plugging

In the selection of underwater plugging tools and materials, reasonable selection should be made according to the ship's or dam leakage. Main plugging method: the stopper plugging, soft patch plugging, metal box to seal leak, t patch plugging, screw frame cooperate plugging and plugging box, t activities activities patch plugging, quick dry cement plug cracks, electric welding equipment repair, waterproof seats leak and so on. According to different situations, we should choose suitable methods and materials. In underwater plugging required materials should be able to quickly fill the gaps, and can quickly under water condensation and keep underwater can have certain structural strength, rapid hardening of plaster [1] is a very good choice, then on the choice of injection plugging equipment will choose to adapt to complex underwater environment of high intensity of transmitting equipment, to ensure the work of the leak can in the shortest possible time to complete, and ensure the strength of plugging parts; On flood protection scheme, in the face of the randomness of the accident, damage to the ship or is the hole shape and position of the dam body may vary, at this moment we need to in a certain way to deal with the damaged holes. For vulnerabilities, we can use the method of combination of explosion plugging plug and perforator to deal with broken holes in different situations.[2]

3 Research on emergency rescue of ships

3.1. research on ship subtraction

In order to ensure the safe passage of the ship in the area of the three gorges gezhouba, it is necessary to reduce the load in the former port. It is necessary to ensure the speed of loading and unloading without causing a lot of damage when mixing the weight of the goods. Therefore, the method of reducing load is to be optimized and improved.

The following points should be made in the aspect of the reduction:

- Select advanced cargo cranes to improve the efficiency ratio of the selected machines,
- Prior notice of the disaster reduction precondition to be ready to prepare, calculate the tidal range and adjust the ballast water properly,
- Select different port of barge for different port of destination,
- Quick load off,
 - modified the existing equipment, or introduce using today's most advanced unloading equipment
 - strengthen training, improve the loading and unloading workers' professional skills
 - need to loading unloading equipment distribution, makes reducing load on the steps of operation optimization.
- in order to further the lightening of time, space, to ensure the efficiency, speed, necessary to establish a platform for lightening[3] but in the Yangtze river shelter-forest such a complex case, it is difficult to building a platform of lightening, should not only consider the platform's location, and higher in the three gorges region, surrounded by mountains all around is not easy to choose, and to guarantee the size of the platform, and unable to meet this section of the channel width. So to sum up, as must request for platform construction, the need is artificial on lightening platform construction, the establishment of a complete set of emergency response and under the precondition of shipping environment, to gradually to the implementation of the construction.

3.2 research on the configuration of the tug wheel

The tugboat plays an important role in the occurrence of emergency, which is mainly divided into two aspects.

3.2.1 Configuration of port tug and auxiliary tug in inbound port

In according to the characteristics of the three gorges water, especially in flood season due to the instability flow a lot of ship to port is a very difficult thing, when exam outline the need for effective tug assistance, in terms of tug assistance should do the following:

- The number of towed wheels is not as good as the size of the ship, according to the size of the ship
- Improve the working efficiency of the tug
- Strive for the ability to allocate the tug, and the tug's response should be timely and effective.

3.2.2 Emergency tug configuration

In accident happened or what will happen in an emergency, tug of high-power, high-powered features in the loss of the ship's stability or missing will guarantee stability of the vessel, or is in the ship ran aground and not under the condition of the high tide of cases gives help to the ship. Tug scheduling needs to improve the tug ship is the port scheduling, tug preparations are to be prepared

ahead of time, in the period of accidents, especially in flood season to drill work from time to time about the accident, at the same time to ensure the efficiency of rescue ship, ship it is necessary to the pleiotropic, hull structure more in line with reduce the flow resistance of body and improve the speed of development trend[4], on the basis of improving the ship's condition and optimizing the training on dispatching and strengthening the crew, the configuration of the emergency tug will be more efficient.

3.3 Research on ship search and rescue capability and emergency response capability

For each vessel, in the search and rescue ability to make correct evaluation of whole search and rescue is of important significance to use data envelopment analysis (DEA) and the fuzzy algorithm, first of all, establish multiple membership functions, the synthetic evaluation of the influence of various factors

There are several factors that determine search and rescue capability.

3.3.1 Density of vessel traffic flow

The difficulty of the rescue after the accident often depends on the size of the density of the ship, the ship denser emergency dangerous waters could further aggravate the accident caused by the loss, or cause secondary the happening of the accident, so the research of vessel traffic flow density, get information about the density of the ship.

3.3.2 Emergency tug configuration

Relevant departments of the emergency response speed is reaction of a department's ability to direct factors, at the beginning of the accident is the perfect time to rescue, is the most critical factor decided to rescue ability.

3.3.3 The relevant measures and measures are in accordance with the relevant provisions.

Aid is another key factor of the rescue ability, have a certain search and rescue emergency response speed, effective means of search and rescue is also a great influence on the success of search and rescue

To sum up, the evaluation of search and rescue capability is a multi-objective problem, so the fuzzy comprehensive evaluation method based on data envelopment is used to evaluate.

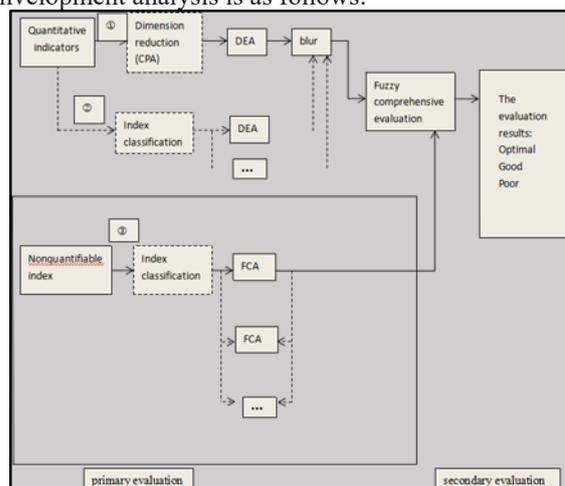
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4.1 The analysis process

Data enveloping analysis method and fuzzy comprehensive evaluation method[5-7] are relatively mature and widely used evaluation methods in comprehensive evaluation. Data envelopment analysis (DEA) can be based on objective data shows the relative efficiency evaluation unit and put forward the corresponding improvement direction, and fuzzy comprehensive evaluation is for the quantitative factors in the evaluation system of index is good for processing. Evaluation results of this paper, by using data envelopment analysis (DEA) as a secondary fuzzy comprehensive evaluation assessment indexes evaluation, using data envelopment analysis (DEA) optimization results instead of fuzzy evaluation of expert evaluation, make the fuzzy comprehensive evaluation more objective and persuasive. The evaluation process of fuzzy comprehensive evaluation method based on data envelopment analysis is as follows:



4.1.1 primary evaluation

When both exist quantitative indicators into the indicator system, there are also the quantitative indicators, the evaluation of quantitative indicators can be according to the statistics, rather than use the fuzzy comprehensive evaluation of the quantitative indicators to deal with the data standardization processing. At this point, we need to evaluate the two indicators separately. The primary evaluation of the D-FEC method is the separation of quantitative indicators and non-quantitative indicators.

The processing of quantitative indicators

When the number of indexes is too high, we use Principal component Analysis (PCA) to treat it. In statistics, principal component analysis is a simplified data set technique. It's a linear transformation. This transform the data transform into a new coordinate system, makes any data projection of the first big variance on the first coordinate is called the first principal component, the second big variance in the second coordinate, the second principal components so on. Principal component

analysis can reduce the dimension of the data space studied. Using the y space of m dimension instead of the x space of p dimension, and the low dimensional y space to replace the high-dimensional x space loss of information is very little. Even if there is only one principal component, y1 (that is), the y1 is still obtained using all the x variables (p). So for example, if you want to compute the mean of Y1, you have to use the mean of all of the x's. In the first m principal component of the selection, if the coefficient of a certain coefficient approximates to zero, this can be deleted as well as a way to delete redundant variables.

4.1.2 secondary evaluation

On the evaluation of the secondary fuzzy comprehensive evaluation can effectively deal with people in itself with the subjectivity in evaluation process, as well as the objective of fuzziness, the fuzzy comprehensive evaluation is usually in the following steps:

- determine the collection of evaluation factors

$$U = \{u_1, u_2, \dots, u_N\}$$

- establish a set of evaluation criteria

$$V = \{v_1, v_2, \dots, v_M\}$$

- determine membership matrix

Assuming the u_i of the No.i evaluation factor, a single factor evaluation is given to a fuzzy vector relative to v_j

$$R_i = (r_{i1}, r_{i2}, \dots, r_{ij}), i = 1, 2, \dots, N; j = 1, 2, \dots, M$$

- conduct multi-level comprehensive evaluation

According to the principle of maximum subordination, the evaluation grade of the evaluation object is determined and the evaluation conclusion is given.

5 Conclusion

Through the processing of quantitative indicators and the combination of fuzzy algorithm to work out the comprehensive evaluation scheme used in dealing with the accident emergency response, thus draws the evaluation level for us in the practical work is more effective to predict the type of accident to choose the right means to cope with the situation, but in the future development, the evaluation method will still new, more outstanding emergency response method is built better service in the field of ship safety, makes the ship safety better security.

References

1. Xing, Yangfeng, Research and application of rapid coagulant paste in the water plugging of foundation cofferdam [J]. Railway construction technology. 2011(09)
2. Chen Xiaoqiang, Zhang Keyu, Zhan Famin, Zhou Fangyi, Research on the technology of underwater patch repair [A] 2008(09)

3. Tang xiaogan, The safety operation of the platform for reducing loading and loading of green huashan mountains [J]. Navigation technology. 2009 (06).
4. GaoLlifeng, Key technical research on the overall design of emergency rescue and salvage tugs [J]. . Dalian university of technology. 2016 (03)
5. Liu Shun, Fuzzy comprehensive evaluation method based on data envelopment analysis and its application [D]. Zhejiang university, 2010
6. Huang Zhaofeng. Evaluation method and application of university education benefit based on fuzzy DEA. [D]. National defense science and technology university 2005
7. Gao Shubin, Liu Zi.based on fuzzy DEA's service government performance evaluation method [J]. Science and technology management. 2011(12)