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Research Article



## Development of optimal strategies in executive management of special waste resulting from dredging of oil products reservoirs using SWOT and QSPM method in National Iranian Oil Product Distribution Company

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### Abstract

Mismanagement of special wastes can bring about destructive environmental effects. Therefore, development of strategic solutions in this sector requires a special attention. SWOT analysis was benefited from in this research as an instrument for planning special waste management system. In order to achieve an acceptable point in special waste management resulting from dredging of reservoirs, internal and external factors in the company were investigated. Then, optimal strategies were developed and eventually in order to specify the relative attractiveness of the determined strategies, Quantitative Strategic Planning Matrix (QSPM) matrix was employed. Based on Internal Factor Evaluation and External Factor Evaluation matrices, it was found that the strong points were more than the weak points, while the available opportunities are less than the threats. Out of the developed strategies, construction of a suitable site to maintain the oily sludges according to environmental requirements are among the top priorities of the strategies.

**Keywords:** Oily sludges, SWOT, strategic planning, special waste management



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## 1 Introduction

Today hazardous wastes can be called as a byproduct of industrialization. Management of hazardous wastes is not merely a local or regional problem and has changed into an international issue [1]. Cleaning oil storage reservoirs off oil sediments is one of the general challenges in oil industries. Annually, large amounts of sludge are produced in storage reservoirs of oil products. This sludge is formed in response to absorption of oil compounds on solid particles and its sedimentation. As this sludge can contain large amounts of toxic organic compounds and heavy metals, it is considered a source of contaminants and releasing it into the environment without employing treatment methods will bring about adverse effects [2]. The Iranian national company of distribution of oil products is responsible for distributing a wide variety of oil products. The important problem in the arena of storage reservoirs is that descaling is conducted every few years on reservoirs due to redevelopment of sludge. Thus the main question among the experts of oil reservoirs area is that how can one prevent development of sediments so that there is no need for multiple descaling on reservoirs, as during descaling, the first problem is that the reservoir becomes out of service and secondly one of the most important problems in the area of environment is the manner of extraction and disposal of oil wastes. So far, regarding treatment, recycling, and management of oily sludges, various attempts have been performed in many countries. In a research by Khabazi et al (2014) on the manner of management of oil wastes, first the stages for managing oil wastes have been summarized, followed by presentation of some solutions for using oil products, which can be of great use regarding both preventing environmental contamination and being economical [15]. Also Philemon & Benoit (2013) on treatment of oily sludges of Cameron refinery, preliminary tests were investigated in treatment of oil sludge using centrifuge for identifying the best recycling solution [16]. Furthermore, Jamali Zavareh et al (2011) investigated the manner of management of oil and industrial wastes in Tehran refinery and stated that application of environmental quality improvement methods in Tehran oil refinery company through developing operational plans with the aim of maximizing the level of recycling and reuse can be effective in preventing incidence of environmental accidents and lowering the risks associated with wastes especially special wastes [17]. In another paper, Khorzani (2013) conducted a study called "strategic planning in waste management" and used strategic management science to investigate the five environmental principles including economic, technical and technological, cultural and social, political, and competitive workforce, with the results of this investigation indicating the opportunities and threats that influence the management [18]. Abedinzadeh et al (2012) performed a study on strategic factors of waste management in Rasht city using SWOT method and development of QSPM matrix. The results of the matrices of internal and external factors suggest that waste management in Rasht city is functioning poorly in terms of internal factors. On the other hand, evaluation of external factors implies that considering the obtained score, currently with reinforcement of opportunities and solving the threats, it can function well [12]. However, this research has a fundamental difference with other studies, in that in previous research only the problems associated with treatment and recycling of oily sludges has been dealt with and so far they have not been cared for considering the manner of management of oily sludges resulting from the oil products reservoirs using SWOT method. In this research, with the aim of filling the knowledge gap, optimal strategies were developed using SWOT method for method the call management of special wastes resulting from dredging of reservoirs. SWOT is an instrument, using which the strong points and weak points along with opportunities and threats are identified and an efficient analysis can be reported about the status of measures taken [14]. The most important objective of this study is to develop optimal strategies in executive management of special waste resulting from dredging of oil products reservoirs using SWOT and QSPM method.

## 2 Methodology

In this research, first the environmental factors (internal and external environments) of Iranian national company of distribution of oil products considering management of special wastes resulting from dredging of storage reservoirs of oil products were investigated and identified. This purpose was fulfilled through completion of questionnaires, investigation of the available reports and documents, interview with managers and experts of environment in the committee and regions, along with field observation of the activities related to oil warehouses [11]. Following identification of the internal and external factors, a list of strong points, weak points, opportunities, and threats related to waste management resulting from dredging of reservoirs was prepared and then the internal and external factors were analyzed and evaluated using IFE matrix and EFE matrix (for external factors). The final score resulting from each of the mentioned matrices represents the status of the company in relation with the internal and external factors. Following development of SWOT matrix, a list of different strategies was prepared across four different groups and in the last stage, the attractiveness and priority of selected strategies were specified using the evaluation matrices of internal and external factors along with SWOT matrix in conjunction with development of strategic quantitative planning matrix known as QSPM.

### 2.1. SWOT matrix

Strengths, weaknesses, opportunities and threats (SWOT) [13] is one of the instruments for determining strategies in many managerial aspects and activities, identifying and introducing all strong points, weak points, along with the available threats and opportunities. Accordingly, it can be used as a basis for decision-making of managers and experts and for determination of objectives [3, 4]. Development of an SWOT matrix consists of the following eight stages [5]: 1- preparation of a list of major opportunities that exist in the external environment of the organization 2- preparation of a list of major threats present in the external environment 3- preparation of a list of the major internal strong points 4- development of a list of major internal weak points 5- the internal strong points and external opportunities are compared together and the result is registered in the relevant house in the group of SO strategies 6- internal weak points are compared with the opportunities available outside the company and the result is registered in the group of WO strategies 7- the internal strong points are compared with external threats and the result lies in group of ST strategies 8- the internal weak points are compared with external threats and the result is placed in the group of WT strategies [6].

### 2.2. Development of the matrix for evaluation of external factors

1- We determine the opportunities and threats 2- a coefficient between zero (insignificant) and 1 (very significant) is attributed to each factor, where a greater coefficient is given to the factors that have caused opportunity, when compared with the threatening factors (the sum of these coefficients should be equal to 1). 3- A score of 1-4 was given to each factor. These numbers represent the extent of effectiveness of the current strategy in demonstrating the reaction to the mentioned factor. Numbers 1 to 4 signify very excellent reaction, a reaction above medium level, a medium reaction, and a poor reaction. 4- To determine the final score of each factor, the coefficient of each factor was multiplied by its score 5- the sum of the final scores of each factor was calculated and the final score of the organization was specified [5, 10].

### 2.3. Development of matrix for evaluation of internal factors

1- We determine the strong and weak points 2- a coefficient of zero (insignificant) to 1 (very significant) was given to each factor. Note that the sum of these coefficients should be equal to 1. 3- A score of 1-4 was given to each factor. These numbers represent the extent of effectiveness of the current strategy in demonstrating the reaction to the mentioned factor. Numbers 1-4 mean the following order: 1: major weak point, 2: minor weakness, 3: strong point 4: very high strength of the factors of interest. 4- To determine

the final score of each factor, the coefficient of each factor was multiplied by its score. 5- The sum of the final scores of each factor was calculated and the final score of the organization was specified with regard to special waste management [5, 10].

#### **2.4. Quantitative strategic planning matrix (QSPM)**

This matrix is an analytical method through which the relative attractiveness of strategies is determined, consisting of the following six stages [5]: 1- the major external opportunities and threats along with internal strong and weak points are written in the right-hand side column of the QSPM. This information should be obtained directly from the matrix of evaluation of internal factors and matrix of evaluation of external factors. 2- A weight or coefficient is attributed to each of the internal or external factors that play a major role in the success of the company. These coefficients function the same as the coefficients of the matrix of evaluation of internal factors and the matrix of evaluation of external factors. These coefficients are written in one column, on the left-hand side of each of the internal and external factors that contribute to the success of the company. 3- The matrix of determination of evaluation the situation and strategic measures is compared with SWOT matrix and determines the strategies that should be performed by the organization. These strategies are written in the top row of the quantitative planning matrix. 4- The attractiveness score is specified. They are numerical values representing the attractiveness of each strategy in a set of strategies. To determine the attractiveness score, the internal and external factors that largely contribute to the success of the company should be investigated and the following question should be posed about each of them: does this factor play a major role in the process of selection of the strategies? If the answer to this question is positive, then considering this key factor, the strategies should be compared with each other. The attractiveness score takes one of the following forms: 1- no attractiveness 2- somehow attractive 3- logical attractiveness 4- very attractive. 5- The sum of the attractiveness scores is calculated. Attractiveness scores signify the multiplication of the coefficient by the attractiveness scores. The sum of the attractiveness scores represents the ability attractiveness of each of the strategies, which is an attractiveness score only considering the effect of relevant internal and external factors. The sum of the attractiveness scores represents the relative attractiveness of each of the strategies which is obtained only considering the effect of relevant internal and external factors. The higher the "sum of the attractiveness scores", the more attractive the strategy of interest. 6- The sum of attractiveness scores of each of the QSPM columns is calculated. The sum of the attractiveness scores suggests which strategy enjoys a greater attractiveness in each set. Higher scores represent more attractiveness of the strategies, considering all of the internal and external factors that can influence strategic decisions. The difference between the sums of attractiveness scores in the strategies implies the desirability of a strategy to other strategies [5].

### **3 Result and Discussion**

The opportunity and threat factors were investigated in special waste executive management resulting from dredging of oil products reservoirs in Iranian national company of distribution of oil products, with the results provided in Table 1 and 2. As can be seen, the final score of the company became 2.27, suggesting that regarding special waste management, the available opportunities are less than threats.

Table 1: The matrix of evaluation of external factors of special waste management resulting from dredging (Opportunities)

External Strategic Factors	Normalized weight	Established score	The final score
Existence of national environmental rules and regulations	0.09	3	0.27
Existence of companies that treat oily sludges	0.1	4	0.4
Achieving economic and noneconomic benefits	0.05	3	0.15
Existence of companies that recycle oily sludges	0.07	4	0.28
The geographical position of the company and its distribution throughout the country	0.08	3	0.24
Preventing environmental contaminations	0.05	3	0.15

Table 2: The matrix of evaluation of external factors of special waste management resulting from dredging (Threats)

External Strategic Factors	Normalized weight	Established score	The final score
The ever increasing growth of costs related to dredging of reservoirs and demolition of sludges resulting from dredging	0.1	1	0.1
The shortage and distribution of treatment centers of oily sludges throughout the country	0.08	1	0.08
The problems associated with transportation and accidents of transportation of the wastes from one point to another and the relevant accidents	0.09	2	0.18
The probability of oil products smuggling	0.08	2	0.16
The ever-increasing intensification of environmental contaminations	0.05	2	0.1
limited access to the latest technologies of the world	0.06	1	0.06
The manner of receiving products in the extent of production of special waste resulting from dredging of reservoirs	0.1	1	0.1

The strong and weak points in special waste executive management resulting from dredging the reservoirs of oil products in National Iranian Oil Product Distribution Company were investigated and provided in Table 3 and 4. As can be observed, the final score of the company was 2.86, suggesting the fact that the strong points act well against the weaknesses in special waste management.

Table 3: the matrix of evaluation of internal factors of special waste management resulting from dredging (Strong)

Internal strategic factors	Normalized weight	The established point	The final score
Existence of short-term executive plans regarding waste management	0.07	3	0.21
Existence of long-term executive plans regarding waste management	0.09	4	0.36
The comprehensiveness of reports and documents (classification, coding, and values of the wastes resulting from dredging the reservoirs of oil products)	0.07	3	0.21
Development of executive instructions and methods regarding dredging and maintenance of wastes resulting from dredging reservoirs of oil products	0.08	3	0.24
Strong determination of the company to solve waste problems	0.09	3	0.27
Existence of research and development section in the company	0.08	4	0.32
Interaction between senior managers and research and development institutes, technical universities and institutes	0.08	3	0.24
Employing the full potential of the company in preventing environmental contamination	0.08	3	0.24
Trust of committee managers to managers of special regions, when managers present fundamental long-term solutions for investing in the procedure of special waste management	0.08	3	0.24
Technical and managerial skills and experiences in solving the problems resulting from waste management	0.07	4	0.28

Table 4: the matrix of evaluation of internal factors of special waste management resulting from dredging (weaknesses)

Internal strategic factors	Normalized weight	The established point	The final score
Existence of operational necessity for reservoirs not to become out of service for cleaning in the amount of production and manner of special waste management	0.04	1	0.04
Ever-increasing and uncontrolled production of sludge in the reservoirs of oil products	0.03	1	0.03
Lack of intra organizational cooperation with the office	0.04	2	0.08
Lack of usage of new technologies or enhancing the available technologies and controlling the level of production of special waste resulting from dredging	0.03	1	0.03
Shortage of resources, budget, and credits required for implementing special waste management	0.03	1	0.03
Lack of risk taking potential in the managers of special regions and committee	0.04	1	0.04

#### 4 Conclusion

Planning and managing special waste enjoys a great significance owing to the conditions of the type of waste along with the current conditions in the country including restrictions for the manner of management considering the possibility of smuggling the product. Therefore, due to the mentioned reasons, many waste management activities cannot be taken easily. Therefore, there should be a system or method that takes

care of all dimensions. One of the best methods is SWOT matrix. In this research, first environmental factors (internal and external environments) of Iranian national company of distribution of oil products were investigated and identified considering management of special wastes resulting from dredging of storage reservoirs of oil products. Based on the results obtained from IFE and EFE matrices, it was found that in executive management of special wastes resulting from dredging of oil reservoirs, the strong points outweigh the weak points, while the available opportunities were less than the threats. Therefore, development of strategies for improving the executive management of special wastes in this company seems to be essential.

In this regard, SO strategies are: SO1: (ST1) increased participation of the private sector to implement long-term and short-term plants regarding treatment and recovery of oily sludges SO2: (ST2) usage of reports and information banks of waste for decision-making on the most optimal waste management method SO3: (ST3) usage of experiences and skills and level of participation of managers in solving the challenges related to special waste management resulting from dredging SO4: (ST4) interaction between R&D section of the company with research and development centers, universities, and technical and research institutes for selecting the best method for recycling and treating oily sludges SO5: (ST5) supervising the proper implementation of national environmental rules and regulations for decreasing and preventing environmental contamination.

ST strategies include the following: ST1: (ST6) use of the potential of domestic construction for decreasing the production costs of the equipment associated with reservoir dredging ST2: (ST7) interaction with universities and domestic training power considering limited access to the latest technology of the world ST3: (ST8) preparation and implementation of long-term plans and programs for waste management considering how the product is received ST4: (ST9) preparation and implementation of short-term plans and programs to prevent the probability of oil products smuggling ST5: (ST10) construction of a suitable and centralized site for keeping oily sludges according to environmental requirements

WO strategies are as follows: WO1 (ST11) promotion of the knowledge and changing the attitude of managements related to enhancing the intra unit coordination and collaboration in waste management process WO2: (ST12) increasing the participation of the private sector using new and portable technologies for dredging, treating, and recycling the wastes resulting from dredging WO3: (ST13) proper formulation of problem at a managerial level for financial support and allocation of necessary budget and credits to implement the waste management system WO4: (ST14) Development of executive instructions and guidelines as well as the elaboration of the duties and managers regarding waste management waste.

WT strategies are: WT1: (ST15) reviewing the executive instructions and guidelines regarding the time of reservoir dredging considering the ever-increasing growth of the costs of sludge dredging and treatment WT2: (ST16) provision of the executive infrastructure of special waste management financially and technically.

Table 5 provide the sum of the attractiveness score of each of the columns of QSPM in National Iranian Oil Product Distribution Company. Having calculated the sum of the attractiveness scores, it was found that in each set, which strategy enjoyed a greater attractiveness. Strategies ST5, ST1, and SO3 enjoy a greater desirability than other strategies.

Table 5: The sum of the attractiveness scores of each of the columns of QSPM

Strategies	SO1	SO2	SO3	SO4	SO5	ST1	ST2	ST3	ST4	ST5	WO 1	WO 2	WO 3	WO 4	WT 1	WT 2
Attractiveness scores	3.36	2.17	3.63	3.07	2.26	3.71	3.12	3.25	2.9	4.24	1.65	3.18	2.64	2.11	3.17	3.18

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