

HANOI UNIVERSITY OF MINING AND GEOLOGY  
Faculty of Economics and Business Administration

**INTERNATIONAL CONFERENCE**  
ECONOMIC MANAGEMENT IN  
MINERAL ACTIVITIES - EMMA 4

- 19<sup>th</sup> - 20<sup>th</sup> November, 2018 - Hanoi, Vietnam



PUBLISHING HOUSE FOR SCIENCE AND TECHNOLOGY

ISBN: 978-604-913-774-7



9 786049 137747

Price: 50 USD

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## INSTRUCTION FOR CONSTRUCTING ENVIRONMENTAL MANAGEMENT SYSTEM UNDER STANDARD TCVN ISO 14001:2015 AT COAL MINING ENTERPRISES

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**Abstract:** On the basis of requirements and instructions for implementation within the standard TCVN ISO 14001:2015, the article analyzed advantages and disadvantages of coal mining enterprises in constructing environmental management system under this standard, identify it can be systematized steps during the construction and applied the environmental management system at coal mining enterprises in Viet Nam nowadays. Standard ISO 14001:2015 application to construct the environmental management system at coal mining enterprises in Viet Nam is in an attempt to assist enterprises with saving costs and improving effectiveness in environmental protection task.

**Keywords:** EMS, TCVN ISO 14001:2015, ISO 14001, coal mining.

### INTRODUCTION

Nowadays, enterprises are exploiting and exporting coal to domestic market such as Viet Nam National Coal and Mineral Industries Group (Vinacomin), Dong Bac Corporation, 319 Corporation, Vietmindo (319 enterprise), etc. In which, Vinacomin occupies a predominant density with 30 million tons per year of average production. The mining industry is an important economic industry of our country, which has been supplying the primary source of fuel serving other industries, such as electric, construction materials, chemical substance production, etc. as combustible for household activities and export. In recent years, coal mining industry has been developing powerfully to meet the demand for domestic consumption increment and export. However, this activity also causes negative impacts to environment and society such as dust pollution, noise pollution, water source contamination, ecosystem reduction, which

cause evil influences to the health of the employees and people surrounding the mining area.

The point of view on the coal industry development from the Vietnamese government since years is "Coal industry development must associate with environmental improvement and protection; be in harmony with tourism development, restrict maximum the evil influence to cultural preservation zones; contribute positively to economic - social development, associate with duty of national defense, security consolidation and strengthening on the area; and ensure the safety in production" (Decision 43). In order to achieve the above missions of the coal industry, environmental management task in the coal industry, environmental management task in coal mining enterprises mainly play a vital role.

To better implement the environmental management tasks, coal mining enterprises have to organize a close environment

management system (EMS). Good EMS organization will assist enterprises in making decisions, rules relating to environment and consistency in implementation through workforce distribution, responsibility assignment, a continuous assessment concerning procedure, process, creating the platform during environmental management activity, lodging the principle to enforce upon people comply as performing tasks influencing the environment. Consequently, it will help enterprises manage the influences to the environment during the production process of enterprises. Also, the Decree 19 (2015) on the implementation of Law on Environmental Protection states "Production, business, service foundations entering into operation resulting from a great quantity of waste matter which risks a serious influence to the environment must implement the confirmation on environmental management system." Therefore, a close environmental management system organization also assists enterprises in complying with the requirements of the law.

There are many models of EMS over the world with various standards. However, ISO 14001 environmental management system is one of the most popular EMS over the world nowadays. ISO 14001 is a part of international standards relating to environmental management applying for all enterprises and organizations everywhere, and now the newest version is ISO 14001:2015 after many times of amelioration. TCVN ISO 14001:2015 standards are fully equivalent to ISO 14001:2015 and proposed by TCVN/TC 207 Standard Technical Committee, Compilation Environmental Management, General Department of Standards Metrology and Quality and declared by Ministry of Science and Technology on September 15<sup>th</sup>, 2015. The purpose of these standards is to provide enterprises with a pattern to protect the

environment and cope with environmental change conditions balancing socio-economic needs, whereby it will contribute to the sustainable development of enterprises by:

- Protecting the environment through prevention or reduction to the harmful influences to the environment.
- Reducing the implicit harmful influences of the environment to enterprises.
- Support enterprises in implementing obligation of law compliance.
- Enhancing the result of implemented environmental protection methods
- Preventing effects from the environment within the life cycle of a product from design production phases to distribution and consumption phases
- Implementation of friendly environment methods will help enterprises' position on market with being reinforced. Consequently, it will help enterprises achieve financial and operational interests.
- Exchange the information about the environment with relevant parties.

TCVN ISO 14001 application has been receiving more and more concerns from the State, management authority and community. National environmental protection strategy up to 2020, outlook to 2030 also determines that "Encourage to apply the modern environmental management according to standard TCVN IS 14001 in order to produce cleaner, audit the waste matter, assess the life cycle of a product and advanced modern environmental management in production and business". Decree No. 19/2015/NQ-CP also regulates that: The foundation owning valid certificate of national standard TCVN ISO 14001 issued by registered certification organization under the law shall be

assess the confirmation on the environmental management system. TCVN ISO 14001 application and certification are being tendencies. In the future, the enterprises must demonstrate their environmental protection to accelerate their business. Nowadays, in the coal industry, there is only Cua Ong Coal Preparation Plant - Vinacomin with its certificate of environmental management system under TCVN ISO 14001.

From urgent environmental problems in coal industry, the regulations of the law on environmental management matters, and the needs of environmental management system application according to ISO 14001 a stated above, construction for an application of an environmental management system according to ISO 14001 at coal mining enterprises are greatly indispensable for enhancement of effectiveness of environmental management task within the coal mining operation in Viet Nam.

#### ADVANTAGES AND DISADVANTAGE OF APPLICATION OF ISO 14001 AT COAL MINING ENTERPRISES

##### Advantages

Following regulations from the State management authority and community with respect to application of ISO 14001 has also been increasing, creating the foundation for the management authority, branches and regions to push up the environmental protection strategy for them to accelerate the application of TCVN ISO 14001 on the scope of the coal industry, including coal mining enterprises.

- Target of sustainable development strategy for the coal industry, as stated in Decision 45, is to minimize the adverse effects of economic activity on the environment, to prevent, control and remedy

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#### ADVANTAGES AND DISADVANTAGES OF APPLICATION OF ISO 14001 AT COAL MINING ENTERPRISES

##### 2.1. Advantages

... Following regulations from the State, management authority and community with ... application of ISO 14001 has also ... increasing, creating the foundation for ... of authority, branches and regions to ... up the environmental protection ... for them to accelerate the application ... TCVN ISO 14001 on the scope of the ... country, including coal mining ...

... Target of sustainable development strategy for the coal industry, as stated in ... 43, is to minimize the adverse ... of economic activity on the ...; to prevent, control and remedy

the pollution, environmental regression, protect and develop the forest, conserve the biological diversification; to restrict the damaging effect of natural disaster, adapt proactively and effectively to climate change, especially rising sea water, which represents that leader staff of coal industry always care about environmental protection matter. It is the foundation so that coal mining enterprises construction EMS on the purpose of implement the above target;

+ Although most coal mining enterprises do not have environmental management office, all enterprises have environmental management staff directly under various departments (mainly Investment - Environment Office). The staff is very primary force assisting coal mining enterprises with constructing EMS;

+ Expenditure for implementation: Coal industry and enterprises all have environmental protection fund, which is a financial source to help enterprises, as constructing EMS on the purpose of implementing environmental protection task.

##### 2.2. Disadvantages

+ Despite enormous advantages of EMS according to ISO 14001 to the society, the State and management authority has not had any policy to support the enterprises in an application of EMS according to ISO 14001 so far. Implementation of requirements of law in environmental protection has not been effective leading to being at a disadvantage to enterprises which care about and invest the environmental protection task;

+ EMS according to ISO 14001 is still reasonably new. Meanwhile, the employee of enterprises has not clearly understood or evenly known. Low capacity causes difficulties in enterprises in deploying the application;

+ Construction and maintenance for EMS according to ISO 14001 require enterprises to spend a significant expenditure and much time implementing. Therefore, it will affect to some extent the business effectiveness of enterprises during the first stage of implementation;

+ The first requirement of enterprises as constructing EMS according to ISO 14001:2015 is to build up environmental policy. However, the establishment of environmental protection policy of coal mining enterprises in Viet Nam is still formalism, even many personnel within enterprises have not known and understood the environmental policy of their enterprise. This causes the restriction in proving the participation of everybody within their organization in environmental protection task;

+ In order to construct successfully EMS at enterprises, it is required to get the engagement from all levels and functional departments of enterprises, and this engagement must be directed by leaders of enterprises. Thus, leaders of enterprises are required to care adequately and closely to implement the system successfully.

+ Most of enterprises and coal mining enterprises inclusive in Viet Nam have not built environmental target associating with general development target of enterprises. Therefore, workforce definement and environmental target deployment are sometimes still apart from other general activities, so it is very difficult to achieve environmental targets set forth.

+ In EMS according to TCVN ISO 14001:2015, internal assessment is a compulsory activity and should be periodically deployed. However, internal assessments within of most of enterprises in Viet Nam, including coal mining enterprises, are mainly formalisms, therefore, it has not proved the effectiveness of internal assessment.

### 3. CONSTRUCT AN ENVIRONMENTAL MANAGEMENT SYSTEM ACCORDING TO ISO 140001 AT COAL MINING ENTERPRISES

EMS at coal mining enterprises is constructed according to TCVN 14001 version of TCVN ISO 14001:2015 with the following steps of process implemented in Fig 1.

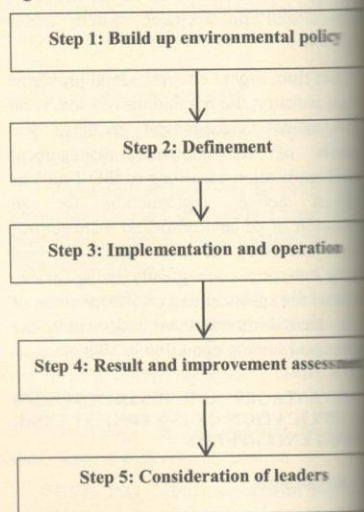


Fig 1. Process of construction for EMS according to ISO 14001

#### 3.1. Build up environmental policy

Environmental policy (EP) is the content of EMS, and the platform to construct and implement EMS. EP is the foundation and the target so that enterprises can apply and improve environmental management system, therefore they can enhance the own result of environmental activities. It must be always considered to ensure sufficient implementation of the system and needs to reflect the engagement of companies

in terms of complying with the requirements of law and other applicable requirements, preventing the pollution and continuously improving. The authors propose the following steps in building EP of coal mining enterprises as follows:

- To define clearly effects to the environment during coal mining, processing, and carry out self-consciously and positively environmental protection task;

- To define the purpose of protecting the environment and maintain environmental protection task;

- To comply with the regulation of law relating to the environment, carry out the requirements relating to environmental protection well;

- To communicate the information, recognize and instruct the personnel

Table 1. Significant environmental aspects

Significant environmental aspects	Relevant activities
Energy	Opening mining pit, processing
Water	Preparing the surface pit, tunneling, coal mining, transporting
Waste	Preparing the surface processing
Other	All activity during mining, transporting
Other	Repairing equipment, washing clothes, do

enterprises in building EP of coal mining enterprises as follows:

- To define clearly effects to the environment during coal mining, processing, carry out self-consciously and positively environmental protection task;
- To define the purpose of protecting the environment and maintain environmental protection task;
- To comply with the regulation of law relating to the environment, carry out the requirements relating to environmental protection well;
- To communicate the information, disseminate and instruct the personnel

within enterprises continuously to implement the requirements of environmental protection, enhance their sense of environmental protection within enterprises;

- + To understand the influences of production on the environment, carry out energy-saving, enhance the sense of environmental protection.

**3.2. Creating an environmental management plan**

*3.2.1. Environmental aspects*

EMS deployment must focus on the relationship between environmental aspects and its effect. The enterprises should have to define environmental aspects of activities during mining. Study group proposes the following significant environmental aspects of coal mining enterprises demonstrated in Table 1.

Table 1. Significant environmental aspects in coal mining activity

Significant environmental aspects	Relevant activities	Influences on the environment
Energy	Opening mining pit, tunneling, processing	+ Source of water + Soil environment
Greenhouse gases	Preparing the surface, opening mining pit, tunneling, coal, and gravelly soil mining, transporting, processing	+ Atmosphere + Health of employee and people living in the surrounding
Solid waste	Preparing the surface, mining, processing	+ Soil environment + People's health
Water	All activity during opening the pit, mining, transporting, processing	+ Health of employee and people living in the surrounding
Other	Repairing equipment, cooking, washing clothes, doing office work	+ Health of employee and people living in the surrounding



### 3.2.2. Obligations for compliance

The enterprises must comply with the following requirements of environmental protection: Law, Decree, Circular, Decision, requirements from governmental institutions and certification organizations, requirements from customers, surrounding populated communities, technical standards of the coal industry, procedures and instructions for work compiled by the enterprises. When the enterprises receive official dispatch or announcement relating to the environmental issue, they have to forward to the Environmental Management Department (EMD) for treatment. Appointed personnel in EMD shall check if the content of documents is fully mentioned of environmental issues. If yes, it can be updated into the list of law on the environment. Update on documents of law on the environment must be carried out frequently and proactively.

If there are documents of law or other requirements which the enterprises must comply, the EMD must report to the General Director to review the importance level. New requirements should be notified to the entire enterprise or relevant departments so that everybody is able to approach and receive the idea about those regulations at the same time, and they are ready for modification of environmental program to meet these requirements.

### 3.2.3. Environmental target and implementation plan

In order to define an appropriate environmental target with each of enterprise, EMD should base on the list of significant environmental aspects and established environmental policies. Coal mining enterprises should follow environmental targets, such as: Complying with the regulations on environmental protection and management for sustainable development, reducing the generating waste matter from mining - transporting - processing,

consuming and saving energy in electric energy and fuel, ensuring the quality of the environment around the mining area, and preventing the breakdowns, etc. The enterprises should provide specific figures with respect to measurable targets.

After establishing environmental targets, the enterprises should build up the plan to carry out those targets by defining clearly the responsibility on the purpose of achieving targets of each functional department and build up the progress to achieve environmental targets.

## 3.3. Carrying out and operating the plan

### 3.3.1. Workforce, role, responsibility, and power

In building EMS, it must be required to construct an organizational structure of environmental management to establish, carry out, maintain and improve EMS. The proposed constructing EMS at coal mining enterprises as follows:

- + Selecting a representative leader of environmental management among department directors.
- + Selecting a specialized head of the office to be directly in charge of environmental management task, and he/she is also an advisory for leaders who are responsible for environmental management.
- + Building up an environmental management structure for each functional department: it should be clearly described the responsibility and power of members and the environment.
- + Reviewing periodically and maintaining EMS in order to be appropriate as necessary.

### 3.3.2. Capabilities, training, and awareness

It is very important to train related individuals on the purpose of constructing appropriate environmental management system with the enterprises. It should be ensured that all personnel and employees

within the enterprise are trained in the environment. With regard to the employees within enterprises, they are needed to be trained to provide basic knowledge of EMS such as introduction to EMS, environmental policy, significant environmental aspects, environmental protection targets and program of the enterprises, and interests of EMS construction, etc. With regard to staff and personnel within environmental management departments, they are needed to be unsightly trained providing insight knowledge of monitoring and operating activities, dealing with urgent situations, set forth pollution prevention and controlling solution to the employees, workers whose jobs are associated with significant environmental aspects. After training, it is needed to evaluate the effectiveness of a training task.

The evaluation with respect to the role and responsibility of each department in carrying appropriateness with requirements of EMS and the potential consequence is implemented owing to their deviation from procedure as regulated.

### 3.3.3. Exchanging the information

Standard ISO 14001 requires the organizations to establish and maintain internal and external communication procedures about their meaningful environmental aspects and EMS. Therefore, the enterprises have to define internal and external communication method:

- Internal information will be identified, reviewed and communicated the requirements of the law on the environment, statutory commitments to all personnel, suppliers, contractors.
- External information will provide information about environmental activities of the enterprises to governmental management authorities so that they contribute their own resources and help the enterprises recover any appropriateness in their own EMS.

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The evaluation with respect to the role and responsibility of each department in achieving appropriateness with requirements of EMS and the potential consequence is documented owing to their deviation from procedure as regulated.

#### 3.3.3. Exchanging the information

Standard ISO 14001 requires the organizations to establish and maintain internal and external communication procedures about their meaningful environmental aspects and EMS. Therefore, the enterprises have to define internal and external communication method:

- Internal information will be identified, retained and communicated the requirements of the law on the environment, voluntary commitments to all personnel, suppliers, contractors.

- External information will provide information about environmental activities of the enterprises to governmental management authorities so that they contribute their own resources and help the enterprises recover any inappropriateness in their own EMS.

#### 3.3.4. Written information

Total documents of the enterprises relating to EMS must be built according to the system and stored this documentation system in the form of text. They are usually represented in the form of the environmental handbook which is valid within the enterprises and very important to the success of EMS because all matters on inappropriateness and other problems during the construction will be systematically stored, whereby it will help the enterprises evaluate easily the result and inspect successfully the EMS implementation process. Moreover, it is needed to have a part of the confirmed evidence to demonstrate continuous appropriateness and operational effectiveness of their EMS if the enterprises wish to obtain Certificate ISO 14001.

#### 3.3.5. Control and operate

To carry out as the engagements of environmental policy and achieve targets set forth, the operations of enterprises relating to significant environmental aspects must be controlled. The enterprises have to define the way to control them and the way to carry out these operations in the condition that controlled by controlling and operating activities. Controlling and operating activities will be represented through procedures, instructions for work, and propaganda picture, etc.

#### 3.3.6. Readily prepare and deal with urgent situations

Although the enterprises use commercially reasonable efforts to prevent pollution, it can be inevitable the happening environmental incidents in an urgent situation which the enterprises are unanticipated, such as landslide in the edge of mine, water cracking, working accident, fuel explosion, pit collapse, etc. Thus, it is very crucial to readily prepare and deal with urgent situations. It helps the enterprises prevent and

reduce the environmental effects to the minimum, reducing the damage of asset, reducing the cease time of enterprises because of the incidents.

### 3.4. Assessment of the result and improvement

#### 3.4.1. Following, measuring, analyzing and assessing

In order to ensure maintenance and effective operation of EMS, the enterprises should supervise the activities, especially the ones generating environmental aspects. Supervision and measurement should be stored into a file to follow the effectiveness of implementation, respective controlling an operation which is appropriate with environmental targets of the enterprises.

The enterprises should periodically carry out measurement with respect to quality of the surrounding environment and factors to supervise such as exhaust fumes, sewage, dust concentration, dangerous waste, used raw materials, and microclimate. Measurement result will be the basis to follow the quality of the surrounding environment of enterprises. Measurement task with respect to environmental targets of enterprises can be self-implemented or outsource the functional unit. However, according to author group's proposal, the enterprises should outsource because it is in relation to specialty, machine and equipment, experience, etc. Thus, it will be ensured the accurate measurement result.

#### 3.4.2. Assessing the compliance

Level of compliance assessment will be self-assessed when there is a change about law and other requirements, a reminder of concerned parties about environmental aspects, or any requirement from governmental authorities.

The department is responsible for environmental management task uses law and

other requirements, list of significant environmental aspects and the result of supervision and measurement or the inspection and supervision process to assess the level of compliance of personnel and their management. Hence, it can be assessed the level of compliance of an entire area with respect to that requirement. Reasons for a failure of meeting any requirement may be inappropriateness due to the failure of meeting requirement of EMS or new arising environmental aspects.

#### 3.4.3. Internal assessment

During the construction for EMS, enterprises should carry out internal assessments according to the frequency built up in accordance with the plan before, and review their systems on the purpose of examining the effectiveness of implemented processes, settling shortcomings within the system and provide the information and assessment result to leaders.

To complete the assessment, enterprises should build up assessment standards and scope for each assessment, select assessment experts to ensure objectiveness and independence.

#### 3.4.4. Inappropriateness and remedy

It is very difficult to construct a perfect EMS. Thus, when the enterprises construct EMS, there will be surely some inappropriateness during the implementation (especially the first stage of implementation) and they will be discovered through internal/external assessment, supervision and measurement. The inappropriateness of the system must be settled so that EMS is always improved and appropriate with the requirements of TCVN ISO 14001. Therefore, the enterprises should carry out a process to ensure that: Inappropriateness are identified and investigated; the reasons causing inappropriateness are identified

and remedial measures are provided in order to reduce inappropriateness, follow and enhance their effectiveness.

#### 3.4.5. Continuous improvement

Through the result of the internal assessment, inappropriateness will be discovered during the construction for EMS. In order to remedy that inappropriateness, the enterprises are required to carry out continuous improvement for appropriateness, consistency and validity of EMS on the purpose of recovering the remaining shortcomings within EMS, whereby the result of environmental activities within the enterprises is enhanced.

#### 3.4.6. Control the file

The enterprises should store the file relating to EMS which their branches construct, whereby it will demonstrate the EMS implementation process to law authorities, partners, people, and also, to assess real environmental situations of the enterprises creating the basis for EMS improvement process of the enterprises.

The controlling process consists of following stored kinds of file, building up control and term of storing, instructing the employees and cancel when it is no longer used, assigning persons with their relevant responsibility.

#### 3.4.7. Consideration of Board of Managers

Leaders of enterprises should carry out periodic consideration with respect to EMS in each stage so as to ensure its stability, appropriateness, and effectiveness.

The review result of leader may be used as a basis and actions relating to reasonable change of environmental policy, environmental targets and standards, and the factors of EMS which are appropriate for continuous improvement engagement.

significant result of the assessment, if there is a failure or lack of success in the assessment, personnel under the assessment should be assessed in the fire area with reasons for the assessment may be the failure of the new strategy.

**4.2.2. Continuous improvement**  
Through the result of the internal assessment, inappropriateness will be discovered during the construction for EMS. In order to remedy that inappropriateness, the enterprises are required to carry out continuous improvement for appropriateness, consistency and validity of EMS on the purpose of recovering the remaining problems within EMS, whereby the result of environmental activities within the enterprises is enhanced.

**4.2.3. Control the file**  
The enterprises should store the file relating to EMS which their branches construct, whereby it will demonstrate the implementation process to law authorities, partners, people, and also, provide real environmental situations of the enterprises creating the basis for EMS improvement process of the enterprises.

The controlling process consists of collecting stored kinds of file, building up content and term of storing, instructing the persons and cancel when it is no longer used, informing persons with their relevant responsibility.

**4.2.4. Consideration of Board of Managers**  
The leaders of enterprises should carry out periodic consideration with respect to EMS in each stage so as to ensure its stability, consistency, and effectiveness.

The review result of leader may be used as a basis and actions relating to reasonable change of environmental policy, environmental targets and standards, and other factors of EMS which are appropriate for continuous improvement engagement.

#### 4. CONCLUSION AND PETITION

It is extremely essential to construct EMS according to ISO 14001 within the enterprises and the coal mining enterprises particularly. Especially when the environmental awareness of society has been being improved and the severe environmental devastation has been being caused by coal mining activities in the present context. The construction will help the enterprises lessen their pressure relating to environmental issue from society, law, and partners; saving the costs and heighten the effectiveness of production of enterprises, whereby it also contributes to ensuring the general target on environmental protection task of total society. Through the research in the real situation of EMS, analysis of advantages and disadvantages of the coal mining enterprises, the article analyzed requirements and instruction for constructing EMS according to TCVN ISO 14001 at coal mining enterprises. It will be the basis so that managers are able to understand the real situation of EMS, and also, they can study and apply within their own enterprises.

The construction for EMS according to TCVN ISO 14001:2015 in the coal mining enterprises is supportive to carry out and achieve its effectiveness if some following petitions are implemented:

- + For the management government agencies, Vinacomin, and Dong Bac Corporation, etc. there should be structure of encouragement, both legal and financial support policy with respect to the coal mining enterprises as applying EMS according to TCVN ISO 14001:2015.
- + For the coal mining enterprises, they should definitively settle environmental problems, enhancing the environmental awareness of total employee within the enterprise, retrieving financial support from non-governmental organizations, attracting the attention, contribute the opinion from

customers and people living around the mining area, maintaining regular contact with Department of Natural Resource and Environment to be technically assisted and training the environmental managers to be knowledgeable about TCVN ISO 14001:2015, building up documentation system and research and apply within the enterprises.

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## STUDY ON WATER REUSE OF LIMESTON

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Department of Mining and Petroleum Engineering

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**Abstract:** Water is a valuable asset in mining operations of this resource until today. There is a strong concern about its quality and quantity in mining but also in mineral processing. The possibility of reusing the water stored in a Brazilian mine on its second panel. In order to do this, we allowed an alternative water system proposed concepts and notions of water quality and sanitation regulations and guidelines for water reuse. The lack of regulations about the reuse of water is relatively new and it has an enormous range. The Brazilian Resolution 430, which is specific for water reuse, showed that the stored water present in mining activities represents 51% of the total water available. The reuse of water in the underground is suggested, which uses the pipelines already installed. However, the pressure loss study indicates that it is necessary to use a water pump, while for the surface it is appropriate to avoid equipment damages caused by high water reuse, water quality, head p

#### INTRODUCTION

Water has always been present in mining operations. In the Bronze Age, its use was restricted to an indicator of the presence of gold ores since they altered its color. In ancient Egypt, it started to be employed in specific gold concentration methods. It was only considered a strategic resource in ancient Greece, especially in arid areas where the Greeks stocked water for ore