



RESILIENCE OF CHRYSOTILE: AN APPROACH TO CHARACTERISTICS, ENVIRONMENTAL RISKS, HEALTH, AND LEGAL PROTECTION

RESILIÊNCIA DO CRISOTILA: UMA ABORDAGEM ÀS CARACTERÍSTICAS, RISCOS AMBIENTAIS, A SAÚDE E PROTEÇÃO JURÍDICA

RESILIENCIA DEL CRISOTILO: UNA APROXIMACIÓN A LAS CARACTERÍSTICAS, RIESGOS AMBIENTALES, SALUD Y PROTECCIÓN JURÍDICA

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ABSTRACT

The use of mineral resources has accompanied man since antiquity. Today, society is served by mineral products, among these, chrysotile, a mineral that has placed Brazil as one of the world's major producers. The research problem presents the following question: what general conditions allow the maintenance of chrysotile mining and industrialization activity? The objective of this article is to demonstrate the legal conditions and characteristics of the ore that guarantee its operational survival, that is, the resilience of chrysotile in the face of technological, environmental and occupational risks in asbestos mining activities. Thus, to respond to the objectives of the study and the problem pointed out, we chose to conduct a bibliographic research based on theoretical foundations of authors, books, sites of public agencies, as well as analysis of ADI's of the Supreme Court. It was intended to demonstrate the legal conditions that guarantee the survival of chrysotile; operational risks; occupational effects and diseases caused to workers with prolonged exposure to the mineral. Even considering the entire history of negative effects on the environment and health, legal actions with the Supreme Court by the national confederation of industry workers - CNTI, have sought alternatives to maintain the activity, given the social and economic importance of chrysotile, justified by operational guidelines such as controlled extraction and inspections through environmental pollution tests, occupational evaluation, implementation of collective protection equipment and mandatory use of PPE.

KEYWORDS: Chrysotile. Characteristics. Legislation.

RESUMO

O aproveitamento dos recursos minerais acompanha o homem desde a antiguidade. Nos dias atuais, a sociedade é atendida por produtos minerais, entre esses, o crisotila, mineral que colocou o Brasil como um dos grandes produtores mundiais. A problemática da pesquisa apresenta a seguinte indagação: quais condições gerais possibilitam a manutenção da atividade de mineração e industrialização do crisotila? O objetivo deste artigo é demonstrar quais as condições legais jurídicas e características do minério que garantem sua sobrevivência operacional, ou seja, a resiliência do crisotila frente aos riscos de natureza tecnológica, ambiental e ocupacional nas atividades da mineração de amianto. Assim, para responder aos objetivos do estudo e a problemática apontada, optou-se por realizar uma pesquisa bibliográfica com base em fundamentos teóricos de autores, livros, sites de órgãos públicos, além de análise de ADI's do STF. Pretendeu-se demonstrar as condições jurídicas que garantem a sobrevivência do crisotila; os riscos operacionais; os efeitos e doenças ocupacionais causadas aos trabalhadores com exposições prolongadas ao mineral. Mesmo considerando todo o histórico de efeitos negativos ao ambiente e saúde, as ações jurídicas junto ao STF pela confederação nacional dos trabalhadores da indústria – CNTI, têm buscado alternativas para manutenção da atividade, diante da importância social e econômica do crisotila, justificado por diretrizes operacionais como extração controlada e inspeções através de ensaios de poluição

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ambiental, avaliação ocupacional, implantação de equipamentos de proteção coletiva e o uso obrigatório de EPI's.

PALAVRAS-CHAVE: Crisotila. Características. Legislação.

RESUMEN

El uso de los recursos minerales ha acompañado al hombre desde la antigüedad. Hoy en día, la sociedad es atendida por productos minerales, entre ellos, el crisotilo, un mineral que ha colocado a Brasil como uno de los principales productores del mundo. El problema de investigación presenta la siguiente pregunta: ¿qué condiciones generales permiten el mantenimiento de la actividad minera e industrialización del crisotilo? El objetivo de este artículo es demostrar las condiciones y características legales del mineral que garantizan su supervivencia operacional, es decir, la resiliencia del crisotilo frente a los riesgos tecnológicos, ambientales y ocupacionales en las actividades mineras de asbesto. Por lo tanto, para responder a los objetivos del estudio y al problema señalado, optamos por realizar una investigación bibliográfica basada en fundamentos teóricos de autores, libros, sitios de organismos públicos, así como análisis de IDA de la Corte Suprema. Su objetivo era demostrar las condiciones jurídicas que garantizan la supervivencia del crisotilo; riesgos operacionales; efectos profesionales y enfermedades causadas a los trabajadores con exposición prolongada al mineral. Aun considerando toda la historia de efectos negativos sobre el medio ambiente y la salud, las acciones legales ante la Corte Suprema por parte de la Confederación Nacional de Trabajadores de la Industria - CNTI, han buscado alternativas para mantener la actividad, dada la importancia social y económica del crisotilo, justificada por directrices operativas como la extracción controlada y las inspecciones a través de pruebas de contaminación ambiental, evaluación ocupacional, implementación de equipos de protección colectiva y uso obligatorio de EPI.

PALABRAS CLAVE: Crisotilo. Funciones. Legislación.

INTRODUCTION

The use of mineral resources has accompanied man since antiquity. In our daily lives, society is served by products from mining and in Brazil, the mineral potential is relevant, including the mineral subject of this article, asbestos. Thus, asbestos mining obeys operational planning, mining, and processing criteria and due to the degree of danger inherent to the mineral and the process, its production and availability for consumption obeys legal rules, including alternation of production moved by legal actions.

According to Wunsch Filho; Neves; Monau (2001), the large-scale use of asbestos in Brazilian industry has generated many controversies and the attempt to mask the environmental and occupational problems related to mineral mining, which presents different asbestos fibers, both from the group of amphiboles and serpentines – chrysotile.

Multiple efforts from the technical and legal sectors are working on adapting and expanding the Occupational and Environmental Health Surveillance and Information Systems in the Brazilian states for the protection of chrysotile asbestos mining workers. The inspection of this activity becomes complex due to the character of clandestine actions. According to Barcelos, Quitério (2006), although the states of São Paulo, Rio de Janeiro, Pernambuco, and others, have determined the end of asbestos exploitation, Brazilian municipalities continue to maintain mineral exploitation and the results



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on workers' health are always in question, the diseases and physical disability, deaths from lung neoplasms due to silicosis and other diseases are always on the agenda.

The research problem presents the following question: What are the general conditions that make it possible to maintain the activity of mining and industrialization of chrysotile?

The objective of this article is to demonstrate which legal conditions and characteristics of the ore guarantee its operational survival, that is, the resilience of chrysotile in the face of technological, environmental, and occupational risks in asbestos mining activities.

It was intended to demonstrate the legal conditions that guarantee the survival of chrysotile; operational risks and effects on workers with prolonged exposure; occupational diseases resulting from continuous exposure to the mineral.

The assumptions of the study point out that the most efficient alternatives could be the regular increase of inspection in mining regions, greater access to occupational health care, expansion of procedures in exams for the conclusion of diagnoses and the regulation of the activity to determine measures that eliminate the risk through the use of Personal Protective Equipment – PPE (National Confederation of Industry Workers – CNTI, 2013).

They demonstrate the properties of this mineral as facilitators of operations today, even with the history of severity to the health of workers and even consumers. Thus, its physicochemical characteristics make it a mineral with two aptitudes, considering its importance as a raw material for various fields of industry and, on the other hand, its aggressiveness to human health, makes it a mineral excluded by some countries.

Brazilian legislation, through its legal diplomas on chrysotile asbestos, provides for federal laws: Law No. 6,938/1981, provides for the National Environmental Policy and establishes the National Environmental Policy; Law No. 9,055/1995, which governs the extraction, industrialization, use, commercialization and transport of chrysotile asbestos, regulates its use in Brazil, reinforcing the relationship between occupational health and respect for international agreements, including determining tolerance limits for exposure in the work environment.

The purpose of this article is to demonstrate the qualities and conditions that allow the survival of chrysotile even with the history of aggression to human health, under the operational guarantee through legal actions, in addition to demonstrating the technological and environmental risks present in the productive activities in mining and chrysotile processing. It was intended to demonstrate the legal conditions that guarantee the survival of chrysotile; operational risks and their effects on workers with prolonged exposure and occupational diseases resulting from continuous exposure to chrysotile fibers.

In a relevant way, this study highlights the resilience of chrysotile, ensured especially by its important properties for the industry in the face of damage to workers' health, supported by legal decisions. It should be noted that the maintenance of the activity observes the importance of safety and health at work incorporated into the efficiency of processes, standardization of operational



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structures and intervention in the work environment, in view of the economic interests of the market, considering the industrial use and added value to the product.

The choice of theme is also justified in view of the concern with safety and health at work, considering the complexity of diagnosing occupational diseases caused by exposure to the mineral, subjugated by the scarcity or past absence of notifications of occupational diseases in this field of activity.

Especially in the development of the chrysotile mining activity and the work activity inherent to the process, there is a diversity of occupational risks that demand, on the part of public health and companies, different responsibilities in the field of safety, health, and hygiene at work as sciences that act in the research, extraction, processing and consumption, with a commitment to guide risk situations in the face of the challenges imposed by the production system.

QUESTION: WHAT ARE THE GENERAL CONDITIONS THAT MAKE IT POSSIBLE TO MAINTAIN THE ACTIVITY OF MINING AND INDUSTRIALIZATION OF CHRYSOTILE?

Objectives: the objective of this article is to demonstrate which legal conditions and characteristics of the ore guarantee its operational survival, that is, the resilience of chrysotile in the face of technological, environmental, and occupational risks in asbestos mining activities.

It was intended to demonstrate the legal conditions that guarantee the survival of chrysotile; operational risks and effects on workers with prolonged exposure; occupational diseases resulting from continuous exposure to the mineral.

Justification: the purpose of this article is to demonstrate the qualities and conditions that allow the survival of chrysotile even with the history of aggression to human health, under the operational guarantee through legal actions, in addition to demonstrating the technological and environmental risks present in the productive activities in mining and chrysotile processing. It was intended to demonstrate the legal conditions that guarantee the survival of chrysotile; operational risks and their effects on workers with prolonged exposure and occupational diseases resulting from continuous exposure to chrysotile fibers.

The choice of theme is also justified in view of the concern with safety and health at work, considering the complexity of diagnosing occupational diseases caused by exposure to the mineral, subjugated by the scarcity or past absence of notifications of occupational diseases in this field of activity.

METHODOLOGY

The methodology applied to respond to the objectives of the study and the problem pointed out, it was opted to carry out a bibliographical search based on theoretical fundamentals of authors, books, websites of public bodies, in addition to analysis of ADI's of the STF.



CONSIDERATIONS

The present study made it possible to highlight the difficulties in maintaining the mining activity and the resilience of chrysotile. from the perspective of the guiding question: what are the general conditions that enable the maintenance of chrysotile mining and industrialization activity? This article aimed to demonstrate the legal conditions and characteristics of the ore guarantee its operational survival, that is, the resilience of chrysotile in the face of technological, environmental and occupational risks in asbestos mining activities.

The study made it possible to verify that the resilience of chrysotile over time is due to its important characteristics and properties for the civil and mechanical construction industry etc., even considering the harm to human health, supported by legal actions, generated by socioeconomic interests.

It appears from this study that the management of technological risks in chrysotile mining identifies and recommends the need for periodic inspection of workplaces, use of personal protective equipment – ppe by those involved, as well as exposure time based on the service time reduction

The difficulties of banning the use of asbestos in Brazilian industry and its large-scale use in production sectors with the application of restrictive measures and worker exposure limits were highlighted, highlighting the exceptionality of the issue, considering the ban on the activity in Brazilian states. São Paulo, Rio de Janeiro, Pernambuco, among others.

Carrying out exploitation, processing and availability of products derived from chrysotile, serving society without the necessary precautions observed by technical standards exposes the employee to great vulnerability to occupational diseases which, in terms of the number of pathological cases attributed to the worker from exposure to the mineral.

Thus, it is evident throughout history and in the present day, prevention regarding environmental technological risks induce the sectors involved and even society to seek alternative means to avoid the vulnerability of workers involved in the entire chain of the production process, from the identification , planning, evaluation, implementation, monitoring and review of actions intrinsic to risk management that can minimize to the maximum the potential risks inherent in the exploitation and processing of chrysotile.

The national confederation of industry workers - CNTI has sought alternatives with the federal supreme court - STF to maintain activities, given the importance of asbestos in the national economy whose trends are controlled extraction and inspection.

Through methods of environmental pollution tests and the mandatory use of ppe (PORTAL EBC, 2017).

The Brazilian magna carta of 1988 determined the full right of the worker to live in a healthy work environment and free of health risks, without the projection of any type of environmental technological problems generated by production. Within this approach to the operational vulnerability



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of activities involving chrysotile, there is a need for risk management, periodic inspection and the creation of a team of professionals to duly inform workers of risks (BRASIL, 1988).

Brazilian legislation within the scope of the federal supreme court - stf prohibited asbestos mining in 2017. Due to state and municipal legal effects, occasionally, chrysotile asbestos remains active, unlike other activities such as the exploitation and processing of amphibole asbestos that had their operations banned due to the damage caused to the environment and human life. Thus, the capacity of chrysotile, as a raw material, is verified, based on the various physical and chemical properties, to parameterize the maintenance of the industrial process, counteracting the harm (STF, 2017).

The sustainable balance of the production chain complies with specific regulations through tolerance limits, degree of exposure to risk and rigidly guaranteed protection conditions for the well-being and safety of the worker. In this way, the determination of the safe limit is essential and if there is no safe limit, the exposure of workers and the population is put at risk. However, for some products, there is no provision for a minimum exposure limit, regardless of the stage in which it is found, as there are no minimum safety parameters to guarantee the health of the worker.

Thus, in this line of safety for the well-being of workers, the international agency for research on cancer - IARC, linked to the world health organization - who, states that all forms of asbestos are carcinogenic and that other variations of asbestos are toxic, and its dangerousness is undefined due to lack of scientific studies (IARC, 2017).

Furthermore, according to who criteria 203, exposure to chrysotile asbestos increases the risk of lung cancer, mesothelioma and asbestosis, and there is no safe limit for exposure. Without a safe limit, it is not possible to control exposure, which puts workers and the population at risk (FIOCRUZ, 2014).

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