

On Dialectical Thinking in the Process of Gas Disaster Management Research

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Abstract

Dialectical thinking, as the core idea of Marxist philosophy, has important guiding significance in all fields of society today. Marxist dialectical thinking also plays a very important role in gas governance. Most coal mines in China are methane mines, which pose a huge threat to mine safety and employee safety, making gas management particularly important. In the current context of green mine construction, in addition to the mastery of knowledge and technology of gas control, it is necessary to strengthen the cultivation of scientific dialectical thinking of gas control. This paper analyzes the significance of dialectical thinking in the research of gas governance theory from the definition of dialectical thinking, the essence of gas outburst, the objective understanding of gas disasters, the application of dialectical thinking in gas disaster governance, the gas governance system theory and the natural view of gas resources. In order to dialectical thinking can be put into practice in gas control theory, to provide better service for mine safety and efficient green production.

Keywords

Dialectical Thinking; Gas Governance; Coal and Gas Outburst; Green Development.

1. Introduction

In the practice of mine gas control engineering, the governance thinking helps to understand the occurrence and development of gas outburst more profoundly and comprehensively, which is of great significance for the proposal and optimization of mine gas control and utilization scheme. The theoretical research on gas control includes the mechanism, characteristics and control measures of gas outburst, especially the establishment of control schemes and methods for gas disaster prevention and control. In the prevention and control of gas disaster, engineering and technical researchers should consciously establish and scientifically apply the dialectical thinking method of philosophy to overcome the perceptual cognition in the process of thinking and the simple summary of their own experience, so as to avoid gas outburst in the process of migration.

In the context of today's green mine development, gas management and utilization should strengthen the study and application of Marxist materialistic dialectics, adopt dialectical thinking, multi-angle, multi-factor, multi-vision understanding of various problems encountered in gas disaster prevention and control work, comprehensive and dialectical understanding of gas management theory, and then better deal with various safety issues in mine gas.

2. Definition of Dialectical Thinking

Dialectical thinking is a way of thinking to understand things from the perspective of change and development. It is usually regarded as a way of thinking contrary to logical thinking [1]. In other words, things can happen at the same time, or true and false happen at the same time, does not hinder the normal thinking activities. Dialectical thinking is a world outlook based on objective connection, connecting everything in the world, further understanding and perception of the world, feeling the relationship between man and nature in the process of thinking, and then draw some conclusions.

The definition of dialectical thinking in the Complete Works of Marxist Philosophy is that dialectical thinking refers to the thinking mode corresponding to the metaphysical thinking mode and different from the intellectual thinking mode that reflects and uses objective dialectics. Dialectical thinking is the correct reflection and subjective application of the dialectical development process of objective things through concepts, judgments, reasoning and other forms of thinking [2]. It can be seen from this definition that metaphysical way of thinking is a way of thinking that is divorced from practice, isolated, static, one-sided and does not conform to objective reality, which easily leads to idealism [3,4]. The mode of intellectual thinking is a kind of thinking in the form of general logical thinking, which is embodied in formal logic [5]. For dialectical thinking, it is to apply materialist dialectics to a holistic way of thinking in the way of thinking and the process of thinking. The purpose is to reveal the contradictory essence and development law of the understanding object, so as to obtain the objective truth of the relevant object, which is the highest form of human thinking development.

3. Objective Understanding of Gas Disaster

3.1. Objective Law of Coal and Gas Outburst Disaster

As is known to all, any natural phenomenon contains certain laws, which is an inherent internal connection of the objective things themselves that are not transferred by people's will. It is of great practical significance for scientific prediction to reveal the relationship between things and phenomena in the objective world and to correctly understand and master the causal relationship of things. Analyzing the practical problems in engineering technology system from a philosophical perspective is to reveal the laws of nature from a dialectical perspective. If people correctly understand the law of nature and carry out production activities according to the law of nature, it can serve people's production practice, otherwise it may be punished by the law of nature. Coal and gas outburst often occurs in the production process of high gas coal mines, which often causes a large number of casualties and property losses, which is due to the blind production of some mining workers in violation of natural laws in the mining production process. Therefore, many scientific and technological workers adopt different research methods and methods to reveal the essence of coal and gas outburst (i.e., the internal law) from different perspectives. However, the law is deeply embedded in things and needs people to continuously explore and make efforts.

At present, hypotheses, the coal-rock mass involved in the outburst is regarded as a static elastic body or a static elastic-plastic body, and its deformation state is independent of the time factor. A large number of on-site coal-rock rheological phenomena indicate that the deformation of the coal-rock mass involved in the outburst is closely related to the time factor. Since all material movements are carried out in time and space, various forms of movement of matter must be expressed as functions of time and space (time and space are the basic forms of existence of moving matter). Under certain conditions, the time factor has little effect on material movement, which can be subjectively simplified as irrelevant to time. However, when studying the mechanical behavior of coal and rock mass with prominent danger or relatively

soft external load, the influence of time factor on the mechanical properties of deformation process must be considered. Rheological mechanics is the science that studies the movement and interaction of matter in time and space.

3.2. Worldview of Rheological Mechanics

Rheological mechanics is a science that studies the general law of the occurrence and development of material movement and deformation. Mao Zedong pointed out in his "theory of contradiction": Man's understanding of matter is to understand the form of movement of matter, because there is nothing in the world except the matter of movement, and the movement of matter must take a certain form. Rheological mechanics admits the materiality of the world and the objective reality of matter, and believes that the unity of the world lies in its own materiality. The material world is an objective existence that is interrelated and developing. The theoretical basis of rheological mechanics is an objective reflection of the material world. Starting from "everything is flowing, everything is changing", it is necessary to understand the specific form, concrete manifestation relationship of matter, and to understand the relativity of matter, but not to leave absolute relativity.

There is an organic connection between the view of time and space in rheological mechanics and dialectical materialism. It is believed that time and space are the basic forms of all existence, and time and space are the manifestations of certain material relations, but not purely relations. Rheology understands the attributes of time and space from the movement of matter. Time and space are not only infinite in quantity, but also infinite in quality. The character of spatial extension and temporal continuity of a thing or an object is the intrinsic attribute of that thing or object, which can only be recognized by comparison with other things or objects that also have a certain amount of temporal and spatial characteristics. The motion view of rheological mechanics believes that rheology is the form of material existence and the essence of time and space. The properties of matter are shown in rheology. There is contradiction and movement when there is matter, which is the absoluteness of movement. Absolute motion should be shown in the relationship (interaction) of the object, which is the relativity of motion. Rheology is the relative unity of invariance and variation. Rheological mechanics is to quantitatively capture variability from the persistence of the object.

3.3. Gas Disaster Early Phenomenon is not Typical, Need to See Essence Through Phenomenon

Early signs of gas outburst can be divided into sound and silent signs. There are sound signs : First, the ground pressure activity is relatively intense, the roof pressure, the continuous occurrence of slag and support fracture, deep rock or coal seam cracking ; the second is the vibration in the coal seam, and the hand-held coal wall feels vibration and impact ; the third is the sound of artillery or thunder, which is generally the sound of coal artillery and machine guns, firecrackers and splitting sounds that are first far and then near, first small and then large, first single and then continuous. Soundless signs : First, changes in the structure of the coal seam, such as bedding disorder, soft or uneven coal strength, reduced strength, dull luster, dry, easily pulverized, coal dust flying ; second, geological changes, uneven coal thickness, soft layer thickening, steeper inclination, extrusion folds, wavy uplift, fault, coal and rock damage serious ; third, the working face pressure increases, slag appears, rib spalling coal wall bulging, sometimes coal fragments from the coal wall ejected ; fourth, the working face gas emission increases, big and small, drilling, roof, drill, jet, pressure wind, whistle, beep, etc., coal wall cooling, working face temperature cooling [6-8]. However, not all of the omens appear before any protrusion, but only one or several of them, and some of them are not obvious enough to be typical, or some of them are very short before the protrusion occurs.

The essence of coal and gas outburst is the fracture instability of coal rock mass. However, the essence and decisive factor of outburst coal rock formation is chemical action, which is the internal cause of outburst. All geological and structural factors are the external causes of the formation of outburst coal and rock, and the prerequisite for the formation of outburst. That is, geological and structural factors ultimately affect the quantitative and qualitative changes of chemical action and play an important role in the formation of outburst coal rock. Therefore, the essence of outburst is still directly derived from chemical action, which is in the active period of chemical action. If the coal seam has the above precursor, the probability of outburst is relatively large.

4. Application of Dialectical Thinking in Gas Disaster Control

4.1. Understanding the Law of Gas Disaster by Practice

The viewpoint of practice is the primary and basic viewpoint of dialectical materialism epistemology. It is necessary to carry out extensive investigation and research, especially the mining sites where gas outburst disasters have occurred, and focus on the analysis of coal seam geological structure. Thick coal area with complex geological structure of coal seam has dense distribution of outburst points and large outburst intensity. For gas outburst disasters, experience-based governance alone cannot cope with various complex situations, and must rise from perceptual cognition to rational cognition. Through repeated investigation and study, it is found that the occurrence of coal and gas outburst does not lie in the different performance of tunneling and mining, but in the results of multiple factors such as coal seam thickness, coal quality, ground pressure, gas saturation degree, coal mechanical strength and coal weight. If the thickness of the coal seam is large and the coal is soft, the coal body is like a compressed state. The direction of decompression flows to that direction, and the flow will cause a sharp desorption of gas and cause outburst. These are the internal factors causing gas outburst, which is obviously the result of the complexity of coal seam geological structure. According to these cognitive laws, the safety mechanism for preventing gas outburst is established and the measures to prevent gas outburst are formulated.

4.2. Grasp the Main Contradiction of Gas Outburst, Improve the Accuracy of Gas Control

The characteristics of coal and gas outburst are directionality, concentration, similarity, increment and classification [9]. Directionality is that the distribution of coal and gas outburst is closely related to the direction of tectonic line, and the gas outburst belt is often distributed along the tectonic belt. Concentration refers to the uneven distribution of outburst in a mining area. There are mainly several outburst mines, and there are only several outburst working faces in outburst mines. Similarity refers to the similar outburst distribution characteristics in similar gas geological conditions. Increment means that the scale and frequency of coal and gas outburst increase with the increase of mining depth. Classification refers to the size and order of geological structure level before and after the prominent distribution has obvious corresponding control effect.

Dialectical materialism believes that movement is the inherent nature and mode of existence of matter, and is the inherent fundamental attribute of matter. There is no non-moving material, nor does it leave the movement of matter [10]. Coal mining is a dynamic process, and it is also a dynamic process for gas migration. Therefore, the inherent understanding of disasters under deep mining conditions needs to be re-examined. The understanding of the law of unity of opposites is placed in an important position, and the main contradiction is grasped in the detailed study of the law characteristics of the development of gas outburst. At the same time, according to the known scientific facts and scientific principles, the natural phenomena and

their laws are speculated and explained, so that the data are analyzed, summarized, summarized and classified in detail, and a reasonable and acceptable explanation is obtained. Therefore, it is necessary to seize the characteristics of outburst laws, pay attention to the law of unity of opposites and use the perspective of movement to treat gas control problems, and improve the accuracy of gas control.

4.3. Formulating Individualized Gas Control Scheme According to Universality and Particularity of Contradiction

Coal and gas outburst is a very complex dynamic phenomenon. For different mining areas, different mines, different coal seams and even the same coal seam, the laws and characteristics of gas will be different. Therefore, for different mining areas or mines, it is necessary to fully understand the geological conditions of gas occurrence and the law of gas migration, so as to provide an effective prerequisite for the development of personalized gas control schemes in gas mines. All from the reality, respect and grasp the objective laws of gas geology and find out the inherent laws and internal relations of things, make it become the guide of gas control scheme decision.

For the coal and gas outburst prevention and control rules, it is necessary to establish targeted outburst prediction indexes and their critical values in outburst mines. However, many outburst mines in China only copy the reference prediction indexes and critical values given in the rules, which makes the selected outburst prediction indexes and critical values unreasonable [11,12]. Therefore, it is very necessary to establish a sensitive index system for predicting gas outburst in the mine with gas outburst risk combined with its own gas geological conditions. Gas outbursts in different mining areas, different mines and different coal seams have many same or similar characteristics, but due to various factors such as geological structure, there are many individual differences. Therefore, it is necessary to analyze the universality and particularity of different mines and coal seams, and promote gas control from a dialectical point of view, and actively promote efficient and safe production of gas mines.

5. Upholding the Viewpoint of System Theory and Improving the Level of Gas Control

System theory regards objective things as a whole to study their structure, mode and law. It emphasizes that the overall function of the system depends not only on the sum of the functions of the elements, but also on the functions generated by the combination structure of the elements. Systematic gas control is to ensure that coal mine safety production is combined with coal and coalbed methane resource development planning. In the process of specific gas control practice, various gas control projects are systematically and procedurally implemented in time and space [13]. For the low permeability and high gas outburst coal seam, the systematic gas control is based on the theory of mining and strata movement, the theory of pressure relief and permeability enhancement of coal and rock mass, and the theory of gas occurrence and flow. The premise is to realize the safe and coordinated mining of coal and gas, and the fundamental starting point is to remove the low permeability characteristics that restrict the efficient flow of gas. The key links are the pressure relief and permeability enhancement extraction of surface drilling in the planning area, the combined hydraulic fracturing pressure relief and permeability enhancement extraction in the preparation area, and the mining pressure relief and permeability enhancement extraction in the production area. The pressure relief and permeability enhancement is the basic criterion for the implementation of gas extraction. According to the development and design stage of coal resources, the stress state of mining face is divided. Underground joint hierarchical gas control mode of coal seam gas efficient extraction [14].

Therefore, for mine gas control, we should firmly establish the overall system concept, take the removal of low permeability characteristics that restrict the efficient flow of gas as the fundamental starting point, and take the pressure relief and permeability enhancement extraction of surface drilling in the planning area, the combined hydraulic fracturing pressure relief and permeability enhancement extraction in the preparation area, and the mining pressure relief and permeability enhancement extraction in the production area as the key links. In the practice of gas control engineering, it is necessary to emphasize the system theory, strengthen the overall concept, carefully formulate the control scheme, and pay attention to the integrity and relevance of the material system. Thus, the three-dimensional linkage extraction of gas in the mine planning area, preparation area and production area can realize the green, safe, coordinated and sustainable mining of coal and gas.

6. Natural View of Gas Resource Utilization

The natural view of the development and utilization of mine gas resources includes the systematic view of nature and the ecological view of nature. The development and utilization of gas resources is a systematic project, and the universal connection and eternal development of things is a general process. It is necessary to comprehensively grasp and control the object, comprehensively explore the interaction and variation of system elements and elements, elements and systems, systems and environment, systems and systems, and grasp the internal and external environmental relations of the object, so as to effectively understand and transform the object [15]. The utilization of gas resources should pay attention to the importance of national economic development, social development and environmental protection. The development and utilization of gas resources should be included in the whole national economic development system spontaneously. System view of nature is a high-level overall consideration, emphasizing the relationship between gas resources and national economic and social development.

The ecological view of gas resources development and utilization is the embodiment of systematic view of nature in the field of human ecology. Ecological view of nature points out that nature is the premise and foundation of human survival and development, human and nature should be harmonious and unified, natural productivity is the basis of social productivity [16]. The gas resources have natural properties and are closely related to energy engineering production activities, as well as to the ecological environment. Ecological crises such as climate warming and environmental pollution related to gas resources threaten human survival and development. Therefore, we should establish scientific ecological values and the concept of harmonious coexistence between man and nature, and scientifically develop and utilize gas resources to promote the coordinated development of economy, society and ecology.

In today's green mine development prospect, gas management is not only to ensure the safe and efficient production of the mine, but also to focus on socio-economic development and ecological environment issues. Therefore, the development and utilization of gas resources must consider comprehensive benefits. For high gas mines, gas power stations can be reasonably constructed in situ to avoid exhausting gas to air pollution environments, and gas power stations can be integrated into the national grid. In this way, gas control solves the problem of mine safety, and the rational use of gas resources can also contribute to future economic and social development, urban and rural life and ecological construction.

7. Conclusion

The principles and methods provided by dialectical thinking methodology are universal for the research and development of various science and technology, but its necessary condition is that it must be combined with the needs of various science and technology research. In the process

of gas disaster management and utilization, the use of dialectical thinking makes the effect of gas disaster prevention and control work remarkable. The objective world is cognitive. In the gas disaster management, we adhere to the view of practice first, and use the view of dialectics to understand the law of development of things. The various laws of gas disasters can be mastered.

Whether in theory or in practice, resources management and utilization must play the subjective initiative of thinking, comprehensive analysis of all aspects of information, grasp the essence of gas outburst, improve the effect of gas control. The correct and flexible use of dialectical thinking method is helpful to a more comprehensive and profound understanding of the occurrence and development of gas outburst, which can provide excellent control strategy and better serve the safe and efficient green production of mine.

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