



# 定向长钻孔瓦斯抽采新型工艺介绍及技术交流

## Long Directional Borehole Drainage Introduction and Technical Exchange

李恒忠 先生， 董事长

Mr. Li Hengzhong, Chairman

国源煤层气综合利用工程技术股份有限公司

GOWIN Construction of Coalbed Gas

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# 第一部分 传统抽采工艺

## Part I: Traditional drilling technology



## 1.1提高瓦斯抽采效果，是实现煤矿瓦斯减排的重要保证

Improving CMM drainage is important for reducing methane emissions from coal mines

- 煤矿开采和矿后活动中的煤层气逸散是最大的排放源之一
- CMM emission in coal mining and post-mining activities is one of the largest emission sources
- 煤矿瓦斯的开采一般通过地面钻井抽采和井下钻孔抽采两种形式，前者因抽采成本较高很少被采用，后者因抽采成本低，被广泛使用
- CMM is generally extracted by surface drainage and underground drainage. The former is rarely used because of high cost, while the latter is widely used because of low cost





- 过去多采用非定向普通钻机进行抽采，大多抽采浓度较低，不便于利用，逸散的占比较大
- In the past, non-directional drilling rigs were mostly used for gas drainage. Most of the concentration was low, which was not easy for CMM utilization, and most of the gas was vented
- 需要提高抽采工艺，为瓦斯综合利用减排，创作条件 Therefore, we need to improve the drilling technology and prepare for CMM utilization and emission reduction



## 1.2传统瓦斯抽采工艺Traditional drilling technology

中国煤矿瓦斯抽采源于对安全生产的需求，过去多采用非定向普通钻机施工，边抽边掘，边抽边采。The main purpose of drainage is for mine safety. In the past, non-directional ordinary drilling machines were mostly used for developing and mining with gas drainage at the same time.

这种传统的抽采工艺钻孔距离短，抽采范围小，钻孔轨迹不可控，有效进尺少，抽采效率低下，利用率低  
This traditional technology has short drilling distance, small drainage range, uncontrollable drilling track, less effective distance, low efficiency and low utilization.





其劣势主要体现在：The disadvantages include:


### 1、不具有导向功能No directional function

钻孔轨迹无法控制，施工过程中常发生穿孔、穿顶、穿底等问题，有效进尺率低，钻孔分布不均匀，抽采效率低下。The drilling track cannot be controlled and some problems happen such as borehole intersections and cutting into roof and floor. The effective distance rate is low, the borehole distribution is uneven, and the drainage efficiency is low.

### 2、钻孔短、浓度低Short borehole and low concentration

钻孔布置间距近，易出现漏气、堵孔等问题，抽采浓度低，无法利用。Boreholes are arranged with close spacing, which can cause gas leakage, hole blockages and leads to low methane concentration and hence gas venting rather than use.





# 第二部分 新型抽采工艺

## Part II: New drilling technology



## 2.1 引进国外千米定向钻进技术，实现了钻进的精准控制，既“指哪打哪、打哪知哪”。

Introduction of foreign advanced technology of km directional drilling technology, realize accurately control means -- drilling can meets the design requirements.

其主要优势有：Its main advantages include:

### 1、钻孔轨迹可控Drilling track controlled

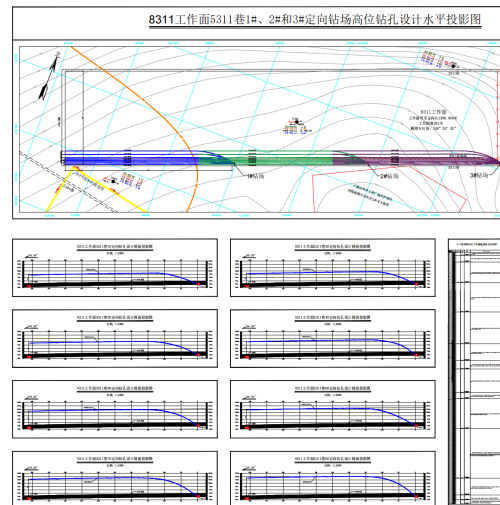
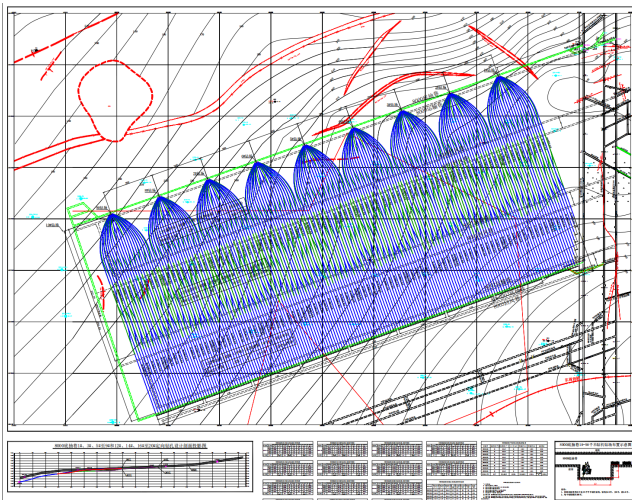
千米定向钻机具有先进的导向和可视功能，确保钻孔严格按照设计轨迹在煤层中穿行，提高钻孔有效进尺，同时避免了抽采盲区的发生，提高了抽采率。

It has advanced guiding and visual functions to ensure that the boreholes pass through the coal seam in strict accordance with the design track, improve the effective boreholes, avoid the occurrence of blind areas for extraction, and improve the efficiency.

### 2、钻孔长度深The drilling length is very long

实现长距离钻进。首先可对掘进工作面实行长距离条带预抽，提高掘进效率；其次向工作面及运输和回风顺槽施工长钻孔，提前对其进行预抽，增加了预抽期，提高抽采效率；再次可在顺槽设钻场向垂直于工作面施工长钻孔，一次解放两个工作面 and 三条掘进巷道，钻孔利用率高，瓦斯抽采效率提升显著。

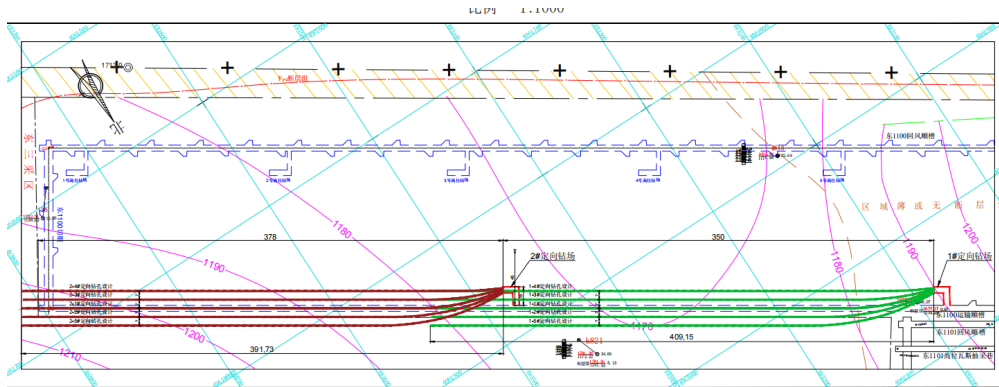
Long-distance drilling. First of all, the long distance strip can be pre-drained for developing to improve the driving efficiency; Secondly, construct long boreholes to the LW and the gates, and pre-drained in advance to increase the pre-drainage period and improve the efficiency; thirdly, set up a drilling field along the gate and construct long boreholes to 2 LW faces and 3 developing roadways., The utilization rate of boreholes is high, and the drainage efficiency is significantly improved



3、可施工穿层长钻孔，钻孔有效抽采段长，能很好地解决邻近层、采空区和上隅角瓦斯。 Can solve gas control in the adjacent seam, goaf and upper corner.

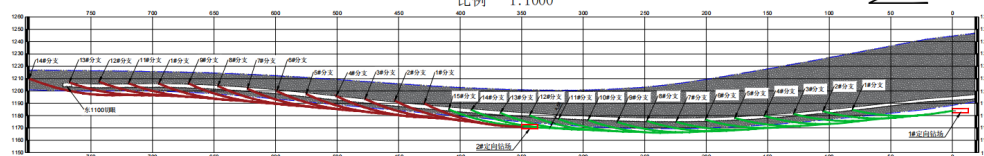
4、可在一个主孔内开设大量分支孔，贯穿煤层层理，沟通裂隙，提高煤层的透气性，增加抽采影响范围，从而提高抽采效率； A large number of branch holes can be drilled from a main hole, drilling through the coal seam, connect cracks, improve the permeability of the coal seam, increase the range and improve the drainage efficiency;

可有效提升瓦斯抽采效率，大幅提高抽采浓度，增加瓦斯利用率，最大限度减少瓦斯逸散等问题响。 Improve the gas drainage efficiency, improve the purity of captured gas, increase the gas utilization rate and reduce the gas emission.



东1100运输槽底板梳状定向钻孔设计剖面投影图

比例 1:1000

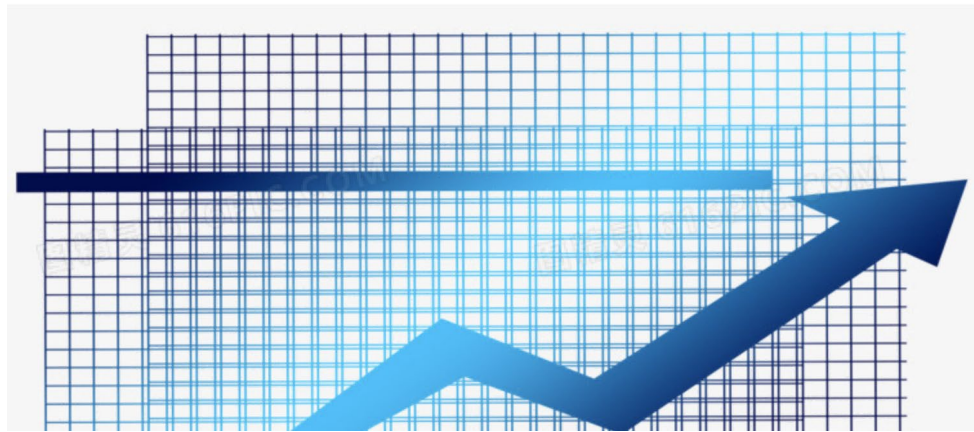


## 2.2 瓦斯抽采取得的成效 Achievements of gas drainage

国源公司2022年实现瓦斯抽采钻孔进尺55万米，可推动煤矿形成每年1.3亿立方米至1.5亿立方米的瓦斯抽采能力。  
In 2022, the total drilling length was 550 Km, with an annual gas drainage capacity of 130 million cubic meters to 150 million cubic meters.

2012年至2021年这十年间，累计完成瓦斯抽采钻孔进尺300万米，推动煤矿实现瓦斯抽采6亿立方米的碳减排成效，实现温室气体减排创造了重要条件。

During the ten years from 2012 to 2021, the cumulative drilling length was 3 million meters, promoting the coal mine to achieve the carbon emission reduction of 600 million cubic meters, and creating important conditions for achieving greenhouse gas emission reduction.





构建了以本煤层定向钻孔（区域预抽）、顶板高位定向钻孔（以孔代巷）、卸压定向钻孔（掩护掘进）、顶底板梳状定向钻孔（松软煤层）等多种长距离钻孔工艺技术为主的瓦斯治理模式：

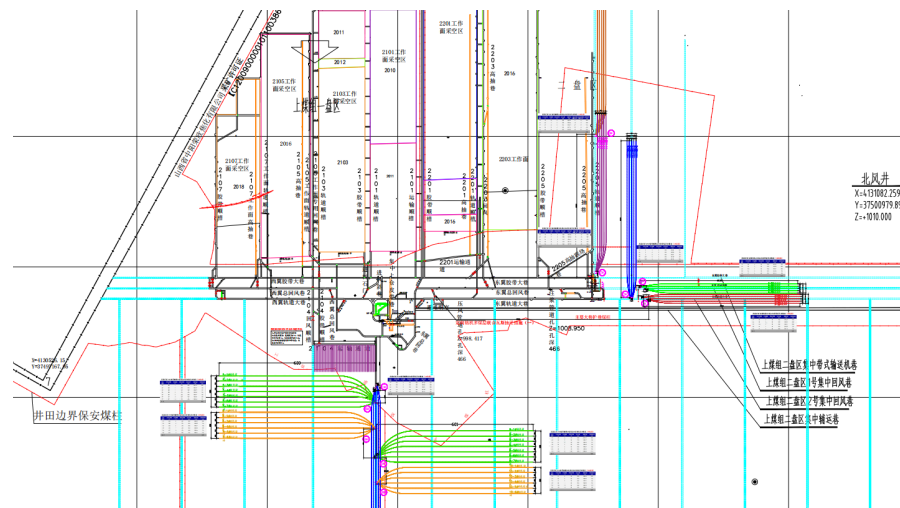
A gas control mode based on a variety of long-distance drilling technologies, such as directional drilling in the coal seam (regional pre-drainage), directional drilling in the roof (hole instead of roadway), pressure-relief directional drilling ( for road developing), combined directional drilling in the roof and floor (soft coal seam) has been constructed:

设计方案中，保证工程超前、能力充足、设施完备、计量准确，  
施工中，秉持“应抽尽抽、多措并举、抽掘采平衡”的基本原则，  
实现了“采煤前先采气，煤与瓦斯共采”的低碳绿色开采技术体系。

The principles in the design are: construction in advance, sufficient capacity, complete installation and accurate measurement.

The principles of construction are that "try the best for drainage, multiple measurements and balanced drainage-developing-mining.

Realize the low-carbon green mining technology of "gas drainage before coal mining, coal and gas co-mining".







# **第三部分 公司简介及业务合作**

## **Part III: Company profile and business cooperation**

### 3.1 国源公司简介 GOWIN Construction of Coalbed Gas

山西国源煤层气综合利用工程技术股份有限公司是一家专业从事煤矿瓦斯抽采治理的企业，自带千米定向钻机，专业设计、施工定向长钻孔，帮助煤矿进行瓦斯区域治理，提高瓦斯抽采率，提高瓦斯利用率、减少瓦斯逸散。

The company is an enterprise specialized in CMM drainage in coal mines, with its own kilometer-long directional drilling rig, which is specialized in the design and construction of directional long boreholes to help the coal mine for CMM recovery, improve the gas drainage rate, improve the gas utilization rate and reduce gas venting.

公司现有员工800余人，拥有千米定向钻机63台，在中国各地设有35个项目部，2022年实现产值4.1亿元。The company has more than 800 employees, 63 kilometer-long directional drilling rigs and 35 project departments across China, with an output value of 410 million yuan in 2022.

作为山西卓越中心的理事单位，公司为煤炭工业积极推广瓦斯抽采减排最佳实践

As the director unit of ICE CMM in China, the Company actively promotes the best practice of CMM control and emission reduction for emission reduction.



### 3.2 技术研发 Technology R&D

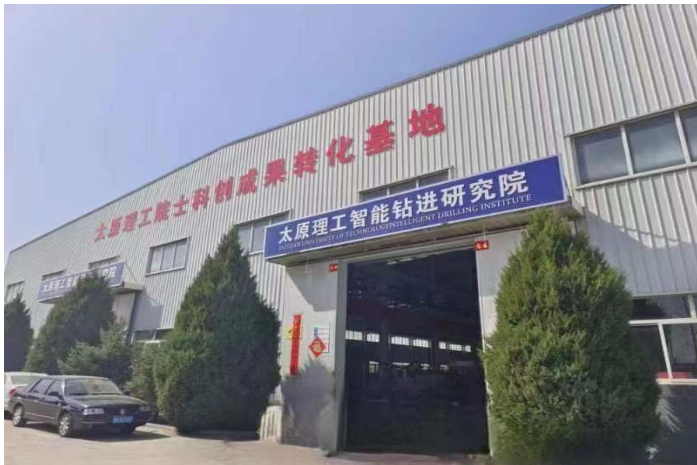
公司2020年与太原理工大学合资成立了太原理工智能钻进研究院有限公司，研发制造高智能化、大扭矩化的新型钻机，进一步提高钻机的智能化水平和不同条件下的适应范围。

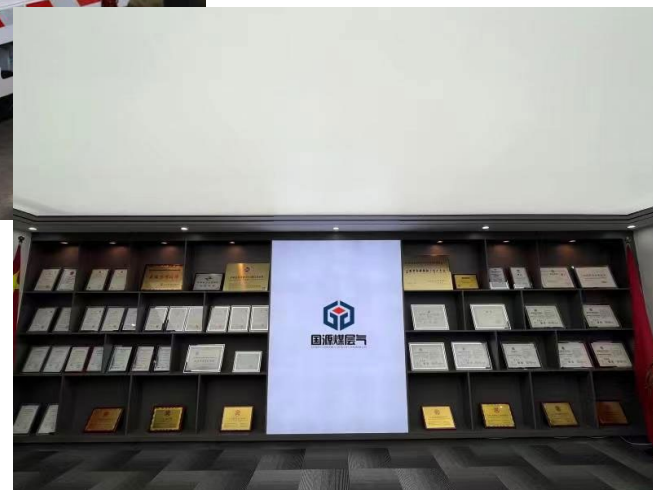
In 2020, a joint venture was established with Taiyuan University of Technology to develop and manufacture a new type of drilling rig with high intelligence and high torque, further improving the intelligence level of the drilling rig and its adaptability under different conditions.

### 3.3 业务合作 Business cooperation

保障煤矿安全生产，提升瓦斯抽采利用率、减少瓦斯排放，为全球低碳环保及甲烷减排作出重要贡献。

Ensuring the safe production of coal mines, further improve the utilization rate of gas extraction, reduce gas emissions, and make important contributions to the global low-carbon environmental protection and methane emission reduction.





**谢谢！ THANKS**