



HOT

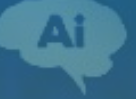
Process For Environment

ARTIFICIAL
INTELLIGENCE

AUTOMATION



CLOUD
COMPUTING



WORKFLOW

Transforming the Way Mining WORKS

SYSTEM
INTEGRATION

HOT (Chengdu) Industries Co., Ltd

www.hotminingepc.com



Excessive Consumption of Energy and Resources

Increasing Carbon Footprint

SAVE OUR PLANET

How Could HOT save our planet?

- XRT sensor-based sorting solution can save much energy, reduce water consumption, and finally decrease the **carbon footprints** and satisfy the **responsible mining**.
- XRT helps to increase the overall value of the deposit by the economic resources increased observably, this would also be beneficial to sustainable development.
- XRT helps to extend the life of mining operations by contributing to more energy-efficient and cost-effective pre-concentrations.
- Remote Control LHD and coming autonomous driving help to approach **ZERO HARM**.
- Manless operation can improve availability of resources. The hazardous mining area where it was restricted area for human due to safety requirement, now it can be mined by machine.
- An active player in **Critical Minerals**' venture exploration, development, operations and off-take sales.

Highlights of HOT

- **Competitiveness, The 1st China company won international bidding from international mining giant**
(AngloGold Ashanti, Congo, A gold ore processing plant, Scope: Engineering + Procurement + Technical Services)
- **Mining Talent, The 1st China company and also the 2nd in the world who applied longwall to hard rock mining (The 1st in the world is Cat Rock Straight System, 2016).**
- **Global Presence, HOT' s services all around the major mining countries, e.g. Congo, Cote d'Ivoire, Russia, Indonesia, Mongolia, Mexico and China.**
- **Pioneer in IIoT-based Intelligent Solution and Digital Enhanced Technologies, Product line cover the compulsory equipment for mining production, e.g. LHD, XRT Sensor-based Sorting, Remote Control, etc.**
- **Reputable Clients: AngloGold Ashanti, China Shenhua, Xstrata (Now, Glencore), SUEK (Russia), etc**



HOT Brief

HOT (Chengdu) Industries Co., Ltd is committed to provide "One-Stop" **X-technologies** and associated services to the resource industry from exploration to mine closure.

Purpose Built **Manless ZERO HARM Mines** by Practical Innovations

- IIoT Sensors & Remote Control Hardware
- Cloud & Big Data & Remote Monitoring
- AI Machine Health & AI Ore Sorting



Revolutionary Products

- **XRT** Sensor-based Sorting Solution
- **Remote Control** of **Underground** Mining Units
- **SAAS** (Asset Lifecycle Management & Maintenances)

Incredible Job Experiences

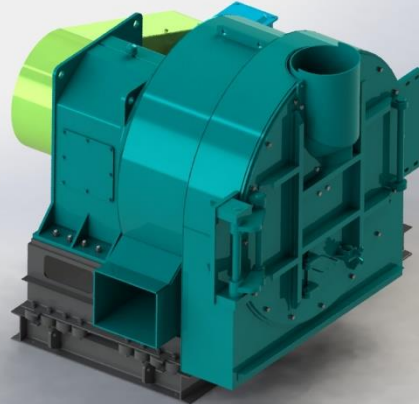
- Crossing over solitary wilderness, Enjoying the remote superb view
- Socially reintegrated with distant lonely aborigines
- Digging the tremendous of Treasure



Primary Business: Core Technologies & Professional Services



XRT Sensor-based Sorting



Solid-liquid Separation Tech



Underground LHDs



IIoT & Intelligent Mining System



Exploration

Exploration Consulting | Technical Report for
IPO (JORC, NI43-101)



Mining

Consulting | Safety Monitoring Technologies
Mining Engineering | Contract Mining



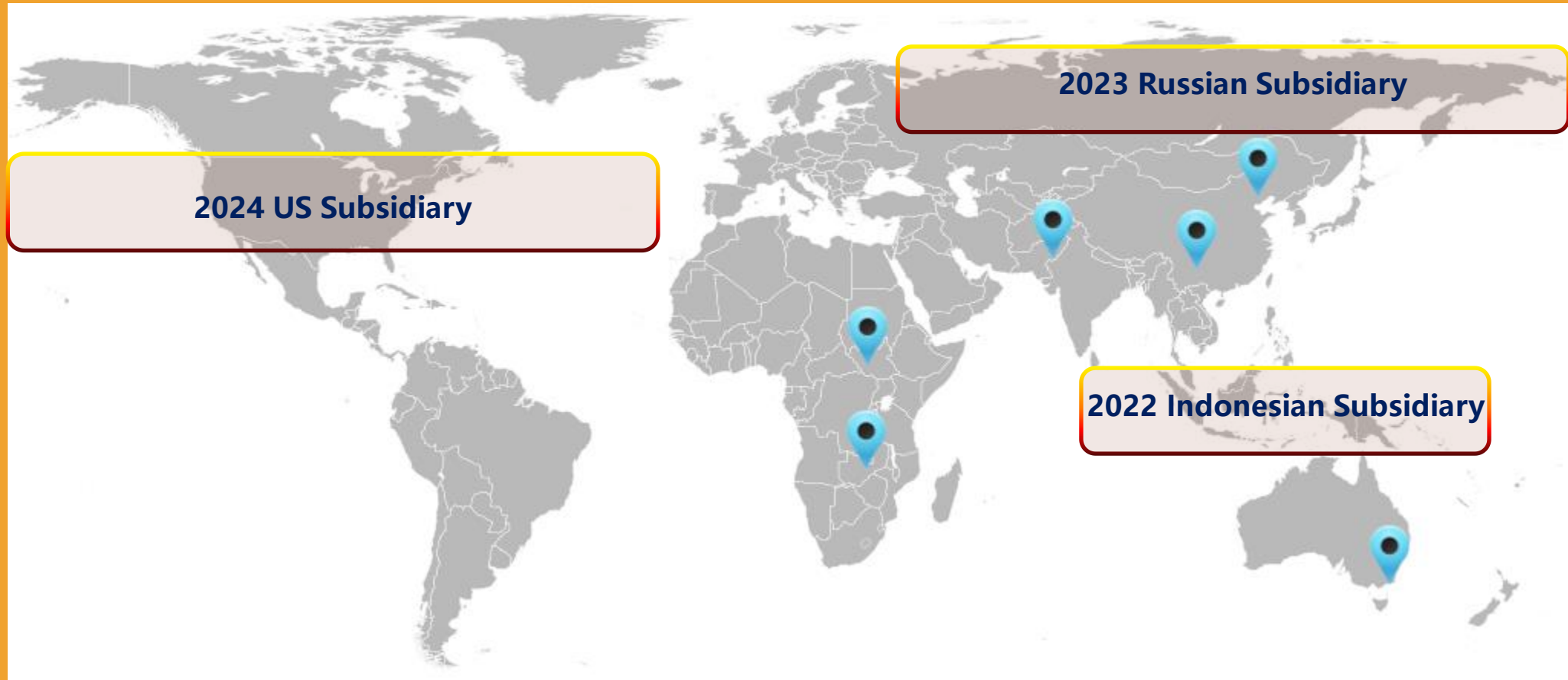
Mineral Processing

Processing Engineering | Project Delivery
Plant Operation & Management

Global Presence



Internationalization



HOT footprint has covered major mining countries, e.g. Australia, Cote d'Ivoire, DRC, Indonesia, Mexico, Mongolia, Russia, Zambia. From 2021, Indonesian and Russian wholly-owned subsidiaries will be set to intensively develop the two targeted markets.

Core Tech - Intelligent Underground Equipment | LHD & Drill Jumbo

HOT
Process For Environment



The core components of intelligent underground equipment are internationally mainstream, Which can bring energy-efficient and energy-saving production operations to the resource industry.

Engine: German Deutz Diesel Engine

Transmission: American Dana R32000 Series

Hydraulic Load Sensing Systems: Danvers, Denmark

Rear Axle: Meritor 16mrf

Core Tech - Trackless Equipment | Smart Controlling System



Line of sight RC < 200m



Remote control

Massive mine operation data:

Each trackless equipment is a mobile data collector and transmitter with consistent photographing function. It can transmit massive data to cloud real-time or with communication condition.

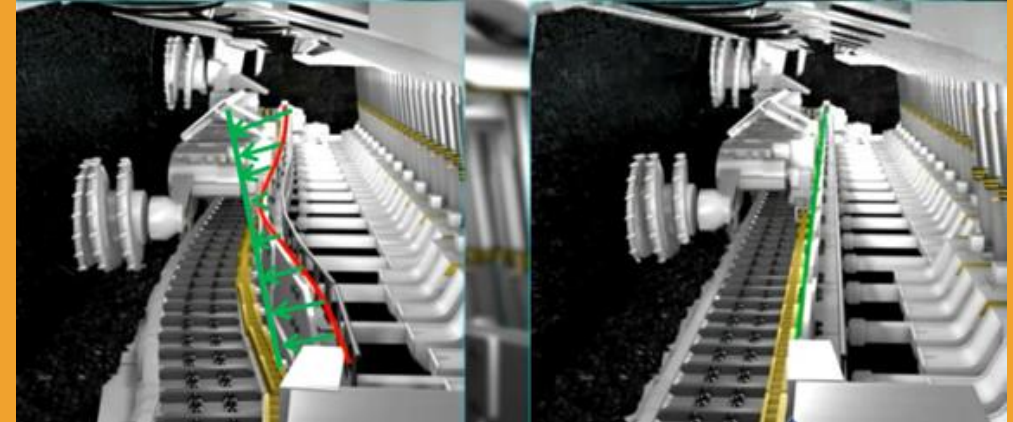
To improve safety, conserve energy and optimize operation efficiency.

Patent Cluster, about 200 patents, among which 10% are invention patents.

Core Tech - Long Wall Mining Trajectory Inertial Navigation Tech

Core technologies mainly include:

- high-precision inertia navigation positioning,
- automatic stretching of working surfaces,
- The working surface remains straight,
- automatic raising control,
- 3D visualization to remote monitoring.



The system adopts military-grade high-precision optical gyro.

Long wall mining equipment equipped with this system can achieve long-term & long-distance unmanned operation.

Improve the efficiency and safety of comprehensive mining equipment for the resource industry.



Core Tech - X-ray Diffraction Topography Sorting Tech (XRT Tech)

TRANSFORMING THE WAY MINING INDUSTRY WORKS



XRT Intelligent Sensor-based Ore Sorter

It is widely used in the separation of metal and non-metallic ores, industrial ores, energy (coal preparation) minerals, slag and many more, like lithium, coal, copper, lead-zinc, phosphorite, tungsten, nickel, silver, gold, antimony, manganese, kaolin, etc.

 Pre-concentration

 Productivity Increase

 Mine Life Extension

 Grade Optimized Control

Versatile AI Ore Color Sorter

High precise ore sorting system utilizing advanced imaging and Artificial Intelligence technology and magnetic levitation ejection system for identification and separation of over 200 materials, providing an ultimate sorting experience.

 AI Identification Algorithm

 Anti-crush System

 Small Particles 6K CCD Camera

 Color&Shape & Quality Sorting

HOT

Process For Environment

HOT (CHENGDU) INDUSTRIES CO., LTD
www.hotminingpe.com sales@hot-mining.com

Energy Conservation

The mining industry consumes 2%-3% of the world's energy. That's the same amount of energy used by the entire airline industry.

Technical Value of Sensor-based XRT Photoelectric Sorting:

- ① Reduce mining energy consumption by 15%
- ② Reduce water consumption by 3-4m³ per R.O.M feed tons.

Improve Resource Value

The poor mines with low economic benefit gain development value by gangue pre-discarding (pre-concentration).

Lower limit of cut-off grade is decreased in developed mines, which effectively prolongs mine lifespan and saves precious resources.

Core Tech - X-ray Diffraction Topography Sorting Tech (XRT Tech)



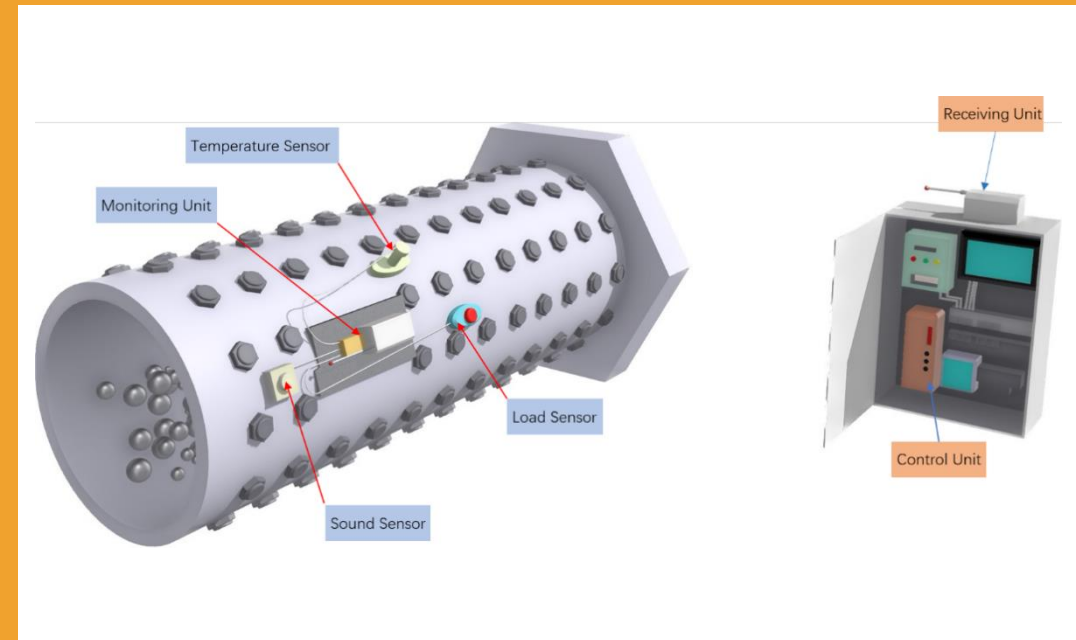
【Patent Cluster】 about 100 patents, among which 10% are invention patents.

Core Tech - AI Comminution Power Optimization Tech

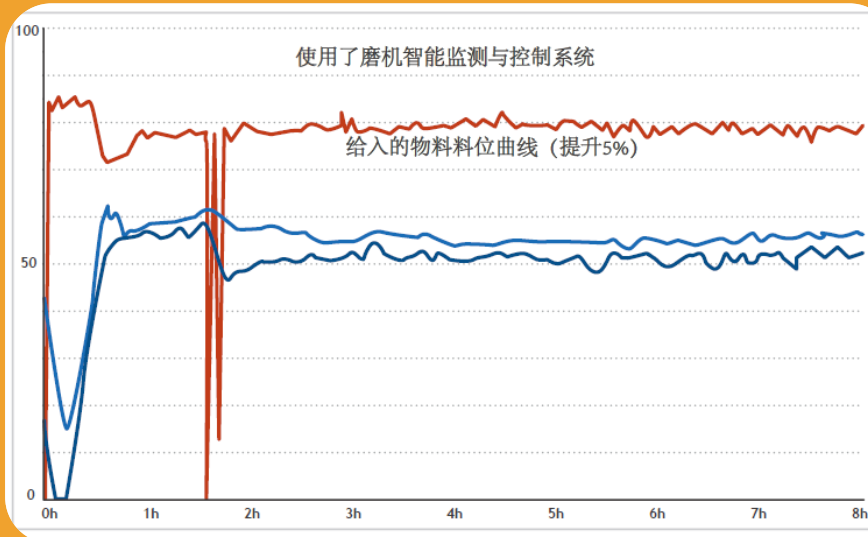
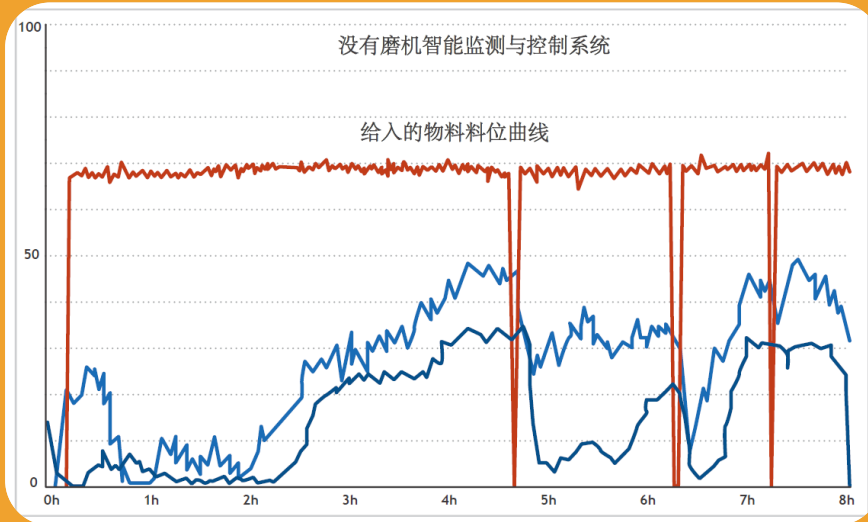
AI comminution power optimization tech consists of two different parts.

Parameter monitoring: The monitoring system is equipped with monitoring units including temperature, vibration, sound, load and other parameters on the ball mill. It can wirelessly send the real-time operation data of the ball mill to the receiving unit, and the receiving unit further transmits it to the basic control unit. Transfer to central database via PLC.

Intelligent control: The control system has multiple modules, including digital filters, bit field manipulation, programmable modules, PI, PID and freely programmable computing modules, as well as AI, including machine learning modules. Based on these modules, the system can establish various characteristic models based on the parameters in the database. The calibration will be able to determine the optimal value of the mill operation, so as to complete the control of the ball mill through the control module.



Core Tech - AI Grinding Power Optimization Tech



Technical Value of AI Grinding Power Optimization :

- ① Increase the production capacity by 5%;
- ② Reduce energy consumption ratio by more than 10%;

Grinding is one of the most energy consumption processes in the production of resource industry.

AI grinding power optimization tech can bring less production costs to enterprises, reduce energy consumption, and improve production efficiency.

Core Tech - Dynamic Density Control for Dense Medium Process

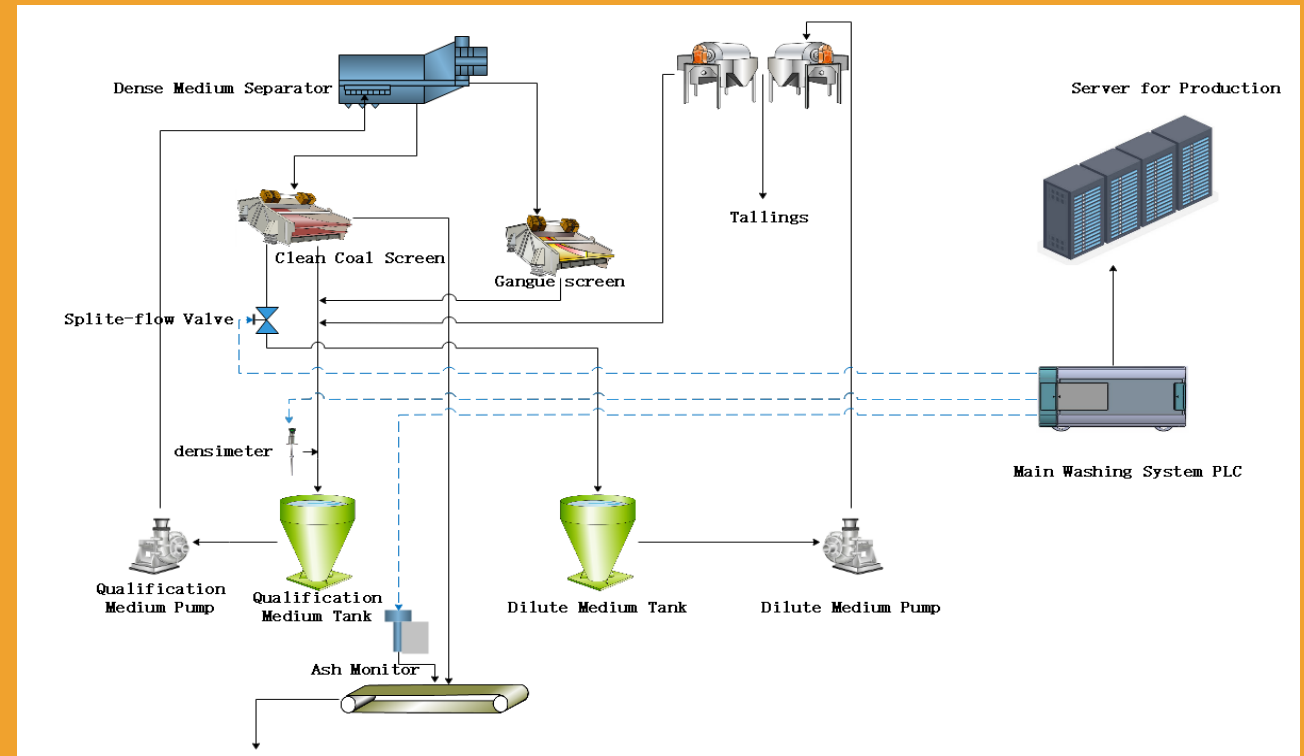
The Dynamic Density Control System automatically adjusts the set density in real time to realize unattended operation. It is mainly applied to two types of dense medium separation systems.



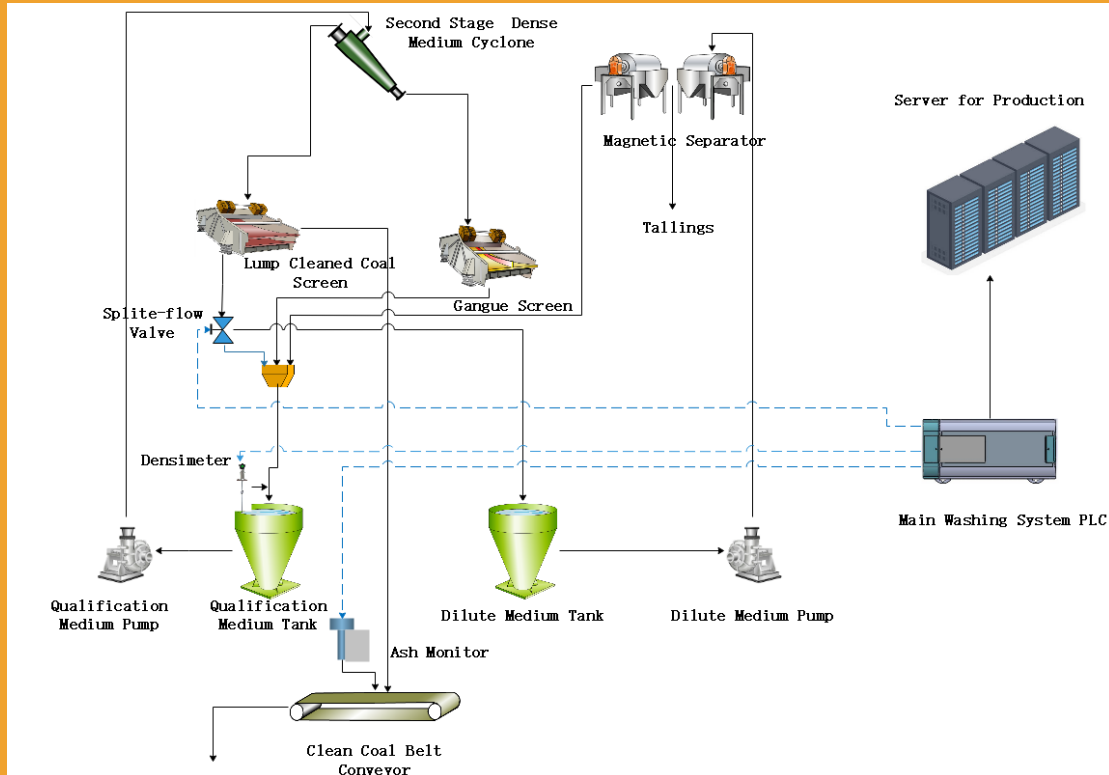
Core Tech - Dynamic Density Control for Dense Medium Process

1. Dynamic Density Control System for Dense Medium Separator in a Coal Preparation Plant

- Replace the Gradiomanometer and Liquid level meter.
- Increase the magnetic medium meter, upstream, horizontal flow is now a manual knife gate valve, to ensure improved the efficiency of the pneumatic valve replaced in front to this position, 5 valves each.
- Connect the water supply valve and divert valve to the density control system.
- The final control goal is to stabilize the setting density of **1.85kg/L**.



2. Dynamic density control system for dense medium cyclone in a coal preparation plant



- Add a qualification medium pump and a tank, add a Gradiomanometer on the outlet pipeline of the qualification medium pump.
- The valves before and after the pump are connected to the intelligent density control system (wear-resistant valve), and the water supply valve and divert valve are connected to the density control system.
- Add magnetic medium.
- The main control target is to stabilize the set density value of **2.00kg/L**.

Core Tech - X-Ray Coal Ash Moisture Analyzer

HOT X-Ray Real-time Ash & Moisture Content Monitor use **X-ray penetration technology** to quickly scan the coal sample on the belt, and uses **artificial intelligence algorithm** to calculate the ash content & moisture content of coal in real time, so as to achieve the purpose of online real-time monitoring of ash & moisture.

**REAL-TIME
DETECTION**

**AI
ALGORITHM**

**RAPID
SCANNING**



Core Tech - X-Ray Coal Ash Moisture Analyzer

Technical Parameter

Measuring Accuracy of Ash Content

Ash Content ≤15%	≤0.5%, 1σ
Ash Content 15%~30%	≤1.0%, 1σ
Ash Content ≥30%	≤1.5%, 1σ

Measuring Accuracy of Moisture Content

5%~10%	≤0.5%, 1σ
10%~20%	≤1.5%, 1σ
More Than 20%	≤2.0%, 1σ

Reference Accuracy of Calorific Value

(The Specific Accuracy Is Given According to The Site Conditions)

Clean Coal	≤100kcal/Kg, 1σ
Low Ash Raw Coal	≤150kcal/Kg, 1σ
High Ash Raw Coal	≤200kcal/Kg, 1σ

Real-Time Data Output

- ◆ Be able to output data stably in real time;
- ◆ Diversified output mode on-demand (hourly/per shift/daily output).

Quality Stability

- ◆ Detection error of less than $\pm 0.5\%$ after standard testing.

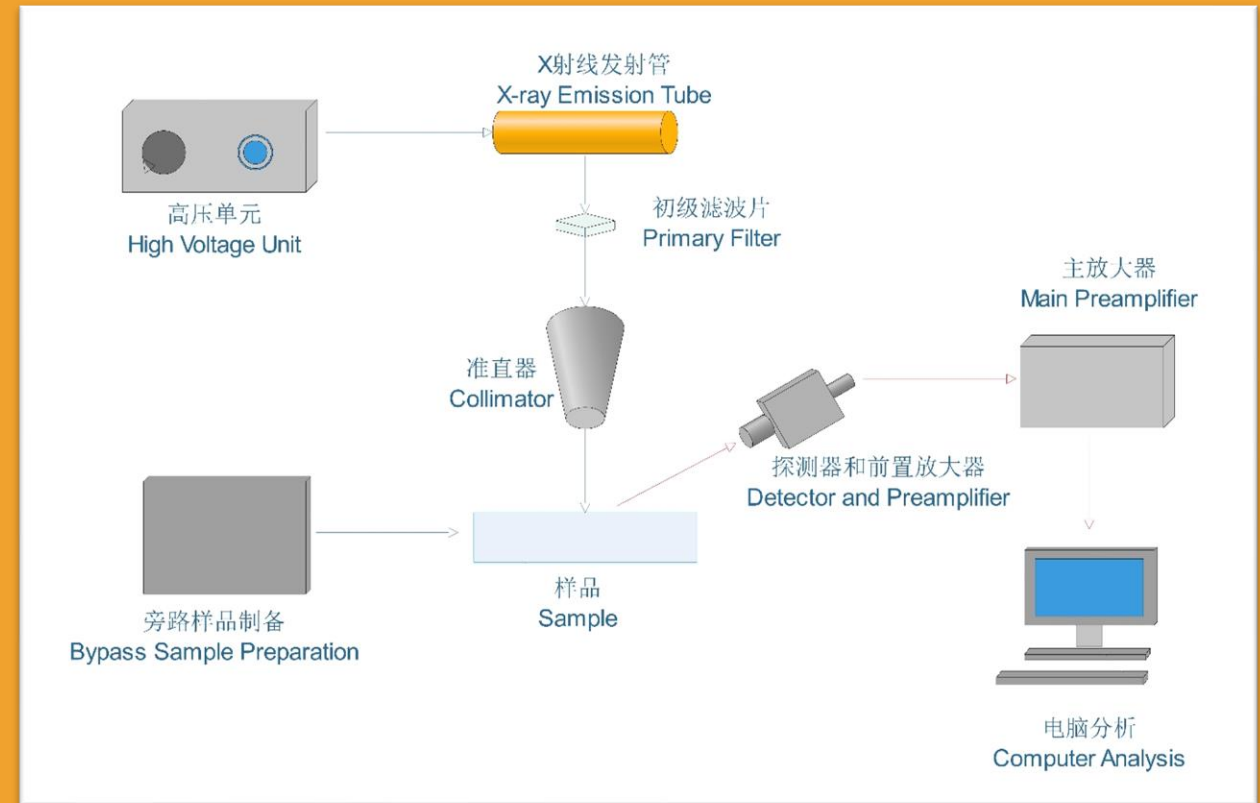
System Linkage

- ◆ X-Ray Coal Ash & Moisture Analyzer can directly link with the automatic density control system or other compatible systems in the coal preparation plant to provide data support for automatic control in the coal processing circuit.

Core Tech - XRF Pulp Grade Analyzer

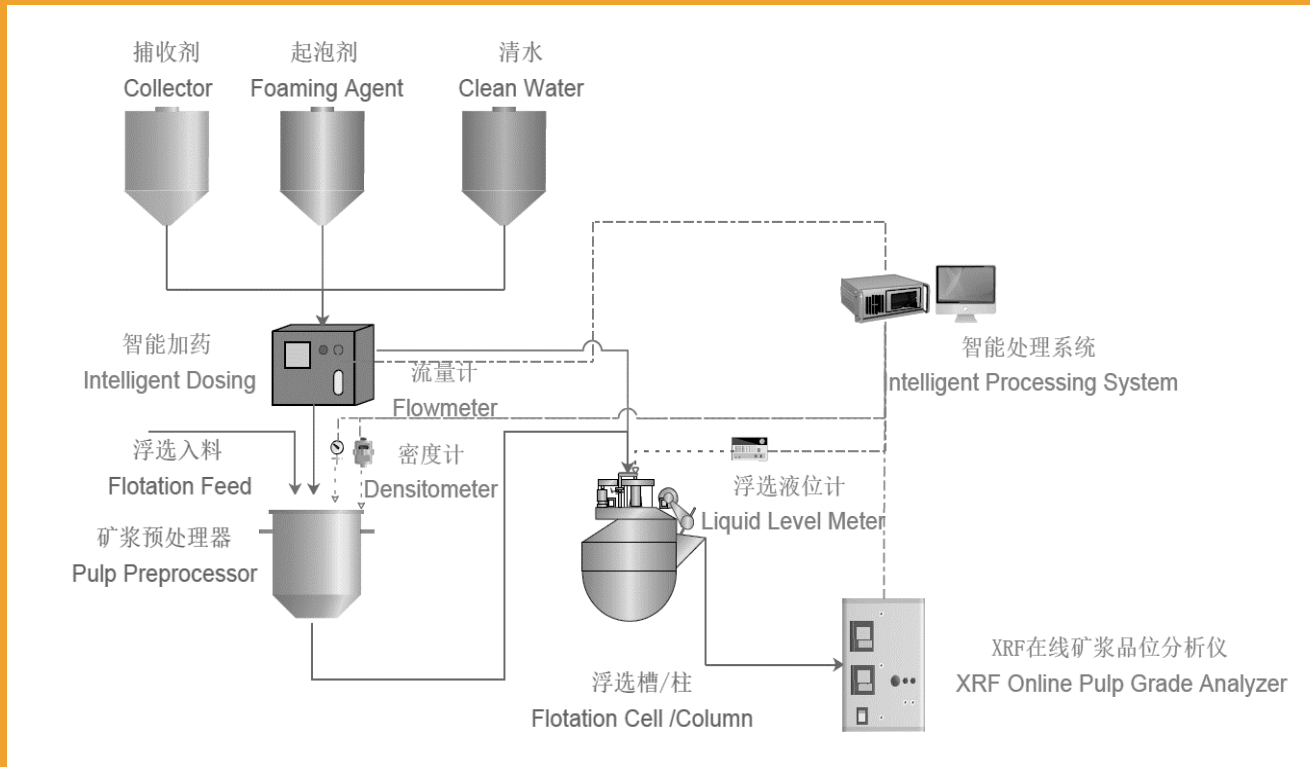
The XRF Slurry Grade Analyzer is an X-ray fluorescence technology featured and highly integrated intelligent instrument for quick online elemental analysis. It can achieve rapid and accurate elemental analysis without sampling for multiple process streams in mineral processing operations.

The exciter generates high-energy X-rays through high voltage, which eject core electrons from atoms and make atoms into unstable excited states. When valence electrons fill these holes, energy is released in the form of X-ray fluorescence. The wavelength or energy of the fluorescence is unique to the element and can be detected using a detector and computer analysis system to identify the element and its content.



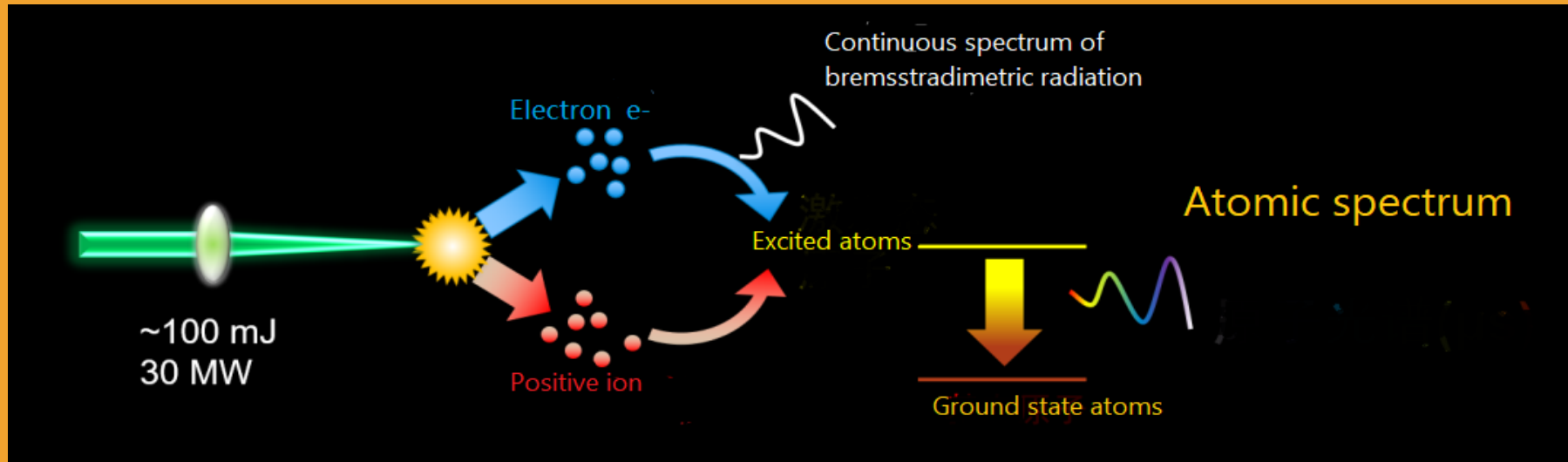
Core Tech - XRF Pulp Grade Analyzer

XRF Pulp Grade Analyzer can be used in the flotation link in the concentrator and is an important online measuring instrument indispensable for the flotation intelligent system.



- ◆ High degree of automation and intelligence
- ◆ Stable and reliable data analysis
- ◆ Representative and fresh samples, fast and accurate analysis
- ◆ No radiation
- ◆ Convenient operation and maintenance

Core Tech - LIPS Fast Elemental Analysis Tech



[Schematic diagram of laser-induced plasma spectral excitation]

LIPS: Laser-induced Plasma Spectroscopy

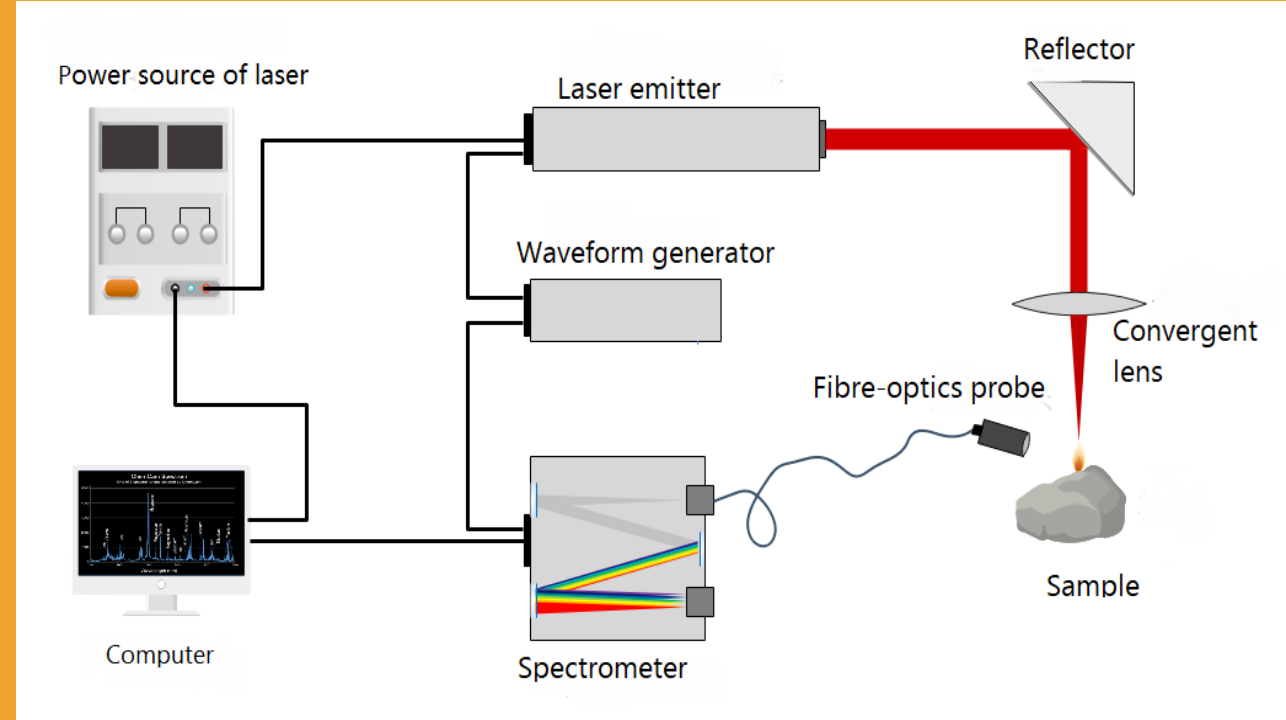
The laser is focused on the sample surface through a lens. When the energy of the laser pulse is greater than the breakdown threshold energy of the sample, the plasma will be generated locally on the sample surface, which is the laser-induced plasma.

As the plasma expands to the outside environment, it gradually cools and emits a spectrum to characterize the composition of the sample.

Photodetectors and spectrometers are used to collect the emission spectrum of plasma. By analyzing the plasma spectrum and combining with the quantitative analysis model, the category and content information of the analyzed samples can be obtained.

Core Tech - LIPS Fast Elemental Analysis Tech

Based on LIPS principle, laser induced fast elemental analysis tech take high-energy laser as the excitation source, irradiate the surface of sample with high energy pulse laser (within a few nanoseconds) , convert the sample of irradiated area into plasma, combined with elemental spectrum analysis system it carries out a special analysis on characteristic spectrum produced by plasma, the sample can be rapidly analyzed on quality and quantity in a short period, thus obtain the information of each element content in the sample.



Core Tech - LIPS Fast Elemental Analysis Tech

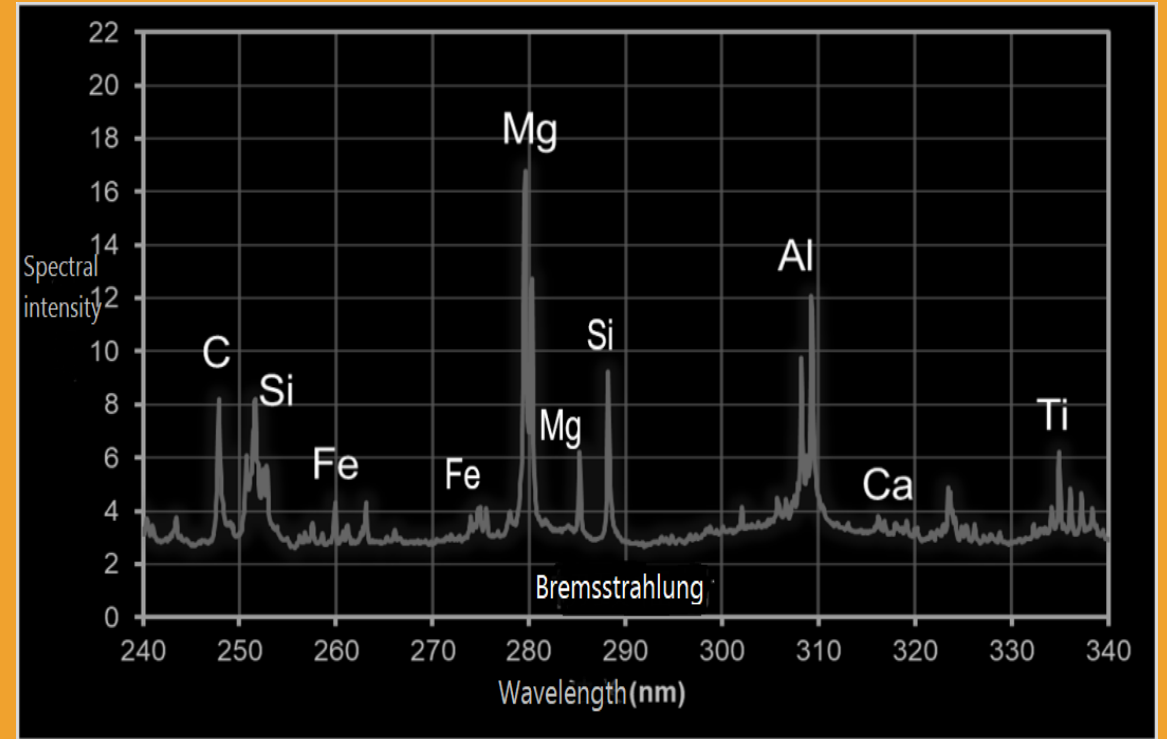
LIPS based fast elemental analysis compared with other technical methods			
Parameters	LIPS based fast elemental analysis	Inductively coupled plasma atomic emission spectroscopy (ICP-AES)	X-ray fluorescence (XRF)
Scope of elements	All	All	Na-U
Preparation of samples	No need	Complicated	Simple
The least detectable concentration	$(10\sim 100)\times 10^{-4}$	10^{-9}	100×10^{-6}
Online analysis	Capable	Unable	Unable
Operation	Simple	Complicated	Complicated
Analysis period	Fast (< 1 min)	Slow (≥ 1 min)	Slow (≥ 1 min)
Auxiliary equipment	No need, buffering gas selectable.	Complicated auxiliary equipment	Vacuum pump

Compared with other traditional elemental analysis technologies, LIPS Fast Elemental Analysis technology has many advantages.

Core Tech - LIPS Fast Elemental Analysis Tech

Fast elemental analysis system based on LIPS technology has a wide applicability. Therefore, its application can be developed based on this technology for different industries, such as:

1. Metallurgical engineering
2. Gem identification
3. Archaeological analysis
4. Biomedical science
5. Food industry
6. Military uses
7. Environmental detection
8. Material analysis
9. Space mining



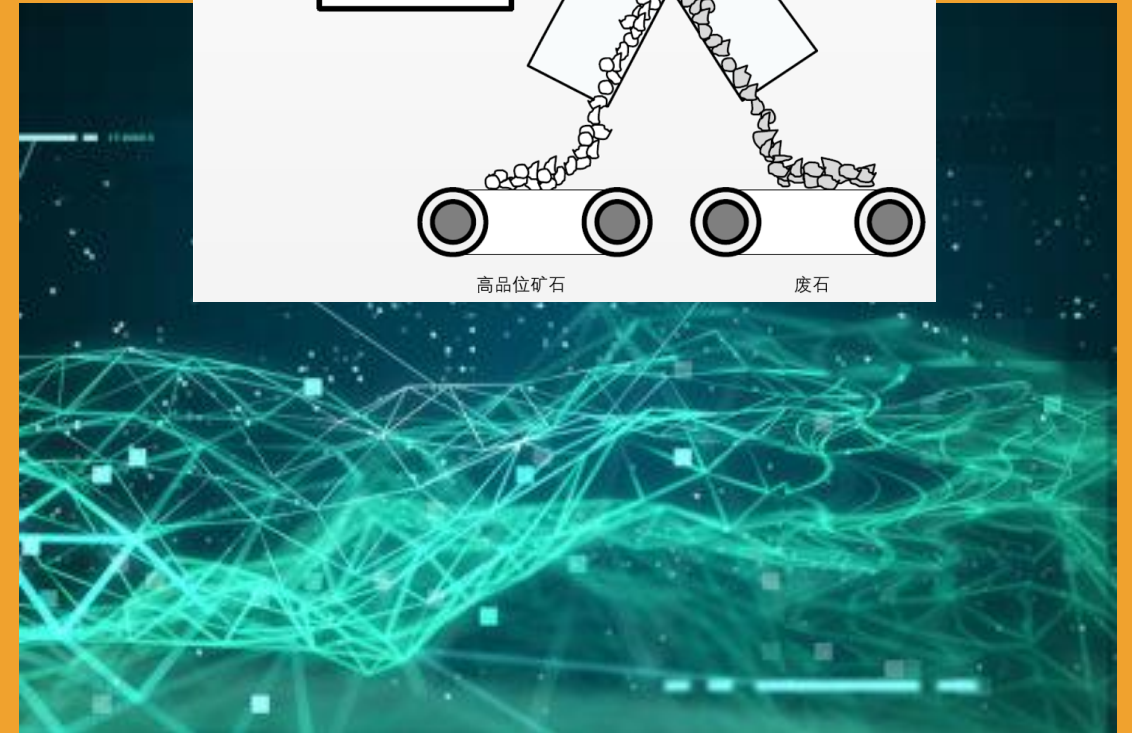
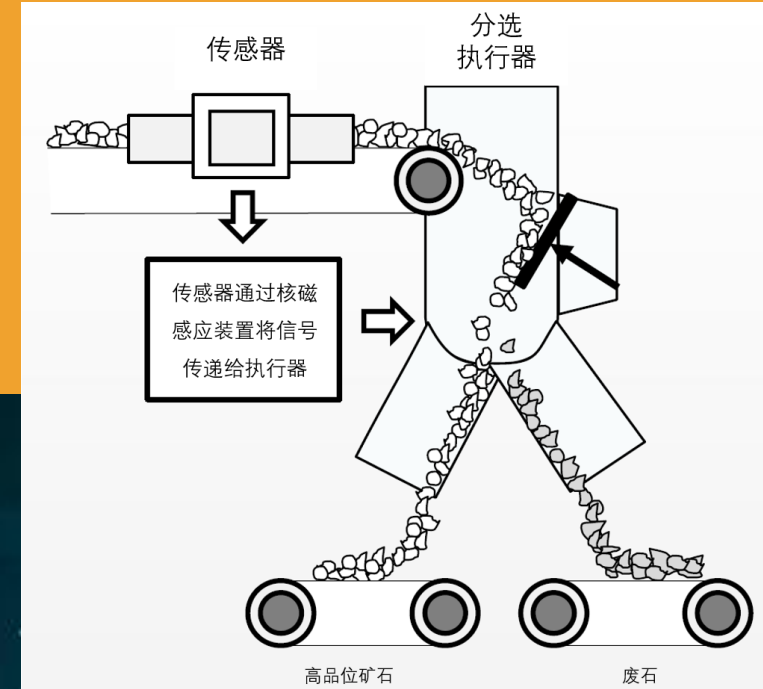
LIPS Fast Elemental Analysis System is safe without radioactive source, and can realize high accuracy and high precision online analysis of coal total elements. It has the characteristics of small volume, simple installation and debugging, easy operation and maintenance, it can provide an effective perception methods for the intelligent construction of coal preparation plant.

Core Tech - AI Magnetic Resonance Ore Pre-sort Tech

AI magnetic resonance ore pre-sort machines use developed magnetic resonance sensing and ore sorting technology to improve ore grade and yield.

The magnetic resonance sensor can continue to detect the iron position of the feed. Through the execution mechanism, the equipment will continue to abandon low -grade ore to prevent low -grade ore from entering the subsequent sorting to reduce operating costs and improve production efficiency.

Compared with XRT technology, the AI magnetic resonance ore pre-sort technology can further increase the amount of ore.



Future - Trackless Equipment | Autonomous Driving



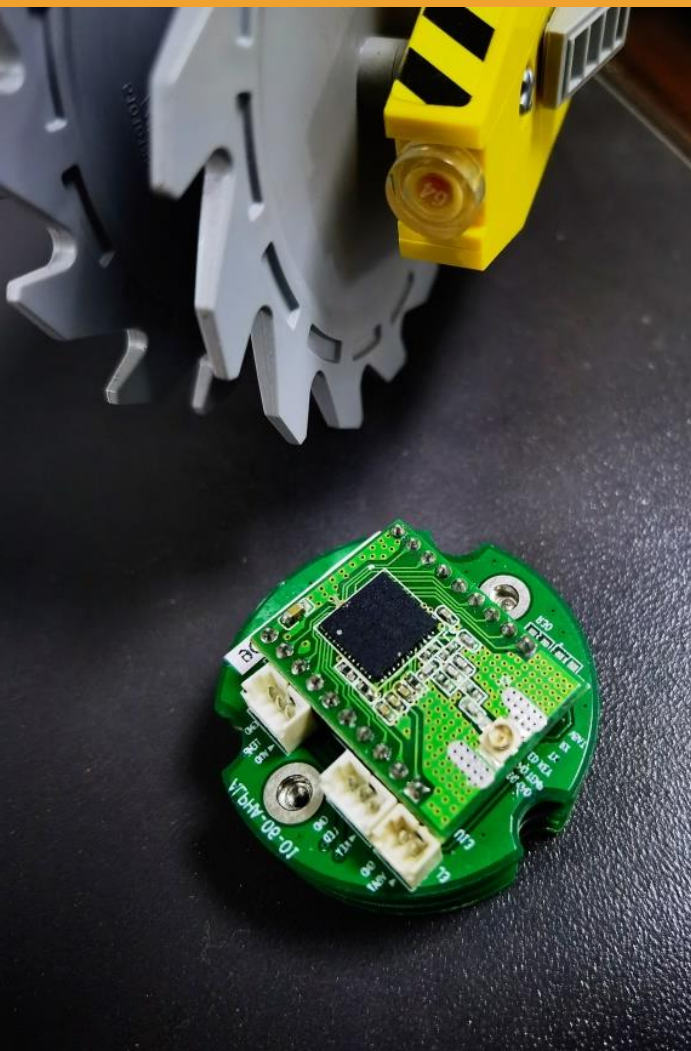
3rd Stage Self-adaptive driving

Future: Autonomous Driving (Underground Mining)

Comprehensively improve mining works safety and efficiency

HOT self-adaptive driving tech - under R&D process (up to now, only two corporations possess the tech)

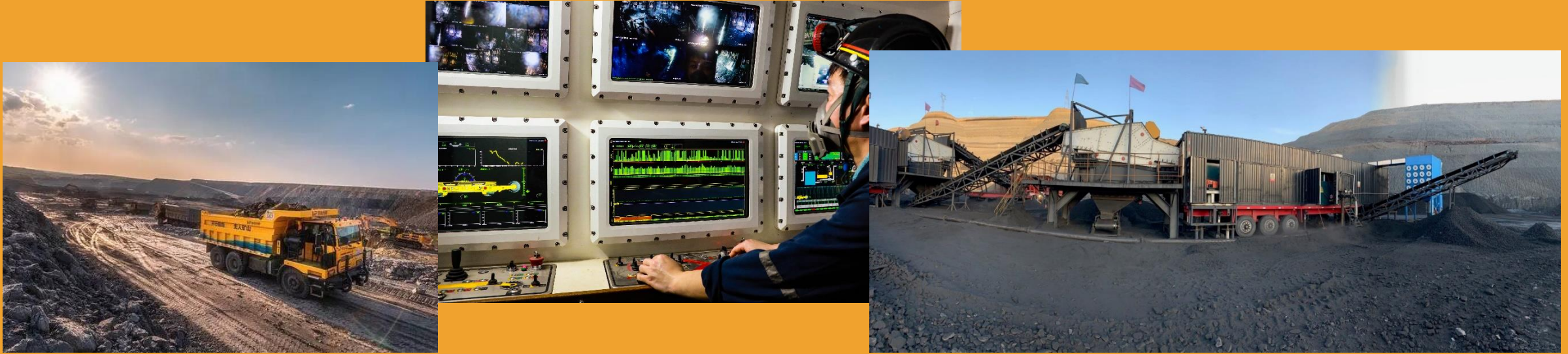
Future - Industrial IoT & Digital Twins



Self-innovated PDM Sensor
Applicable in all kinds of mining equipment

Self-innovated industrial IoT platform, in process of promoting cooperation with more mines and plants to collect mass industrial data.
To provide **SAAS** and **OTA** service in mining field (intelligentialization, emergency management, equipment AI failure prediction and asset lifecycle management)

The future of technology?



Millions of **Autonomous Driving** Equipment and sensor-based sorting system collecting and transmitting global mines production data real-time (running rate, realtime capacity, accumulative capacity, failure and accident, XRT perceives ore grade variety in real time, external CCTV continuously shooting surroundings.....)

HOT data processing ability and algorithm is getting stronger.

.....

Target Market: to serve Critical Minerals and Green Energy Minerals

A semi-transparent image of an F-35 fighter jet is centered in the middle section of the slide. The jet is shown from a side-on perspective, facing right. It has various markings, including the number "105" on the tail fin, the letters "XE" on the side of the tail, and "NAVY" on the fuselage. The jet is set against a solid blue background.

F35 Mineral Demand

Rare earth 417kg

aircraft 80% Aluminum

HOT not only supply crucial product and technical service, but also **has chance to be a shareholder of Critical Minerals.**

Target Market: to serve critical minerals and new energy minerals.

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Green Energy Minerals

Copper, nickel, cobalt, Lithium, Manganese

Green energy minerals is keeping rising in foreseeable future. HOT follows the trends and allocates target in uptrend section.

Target Market: to serve noble metal minerals

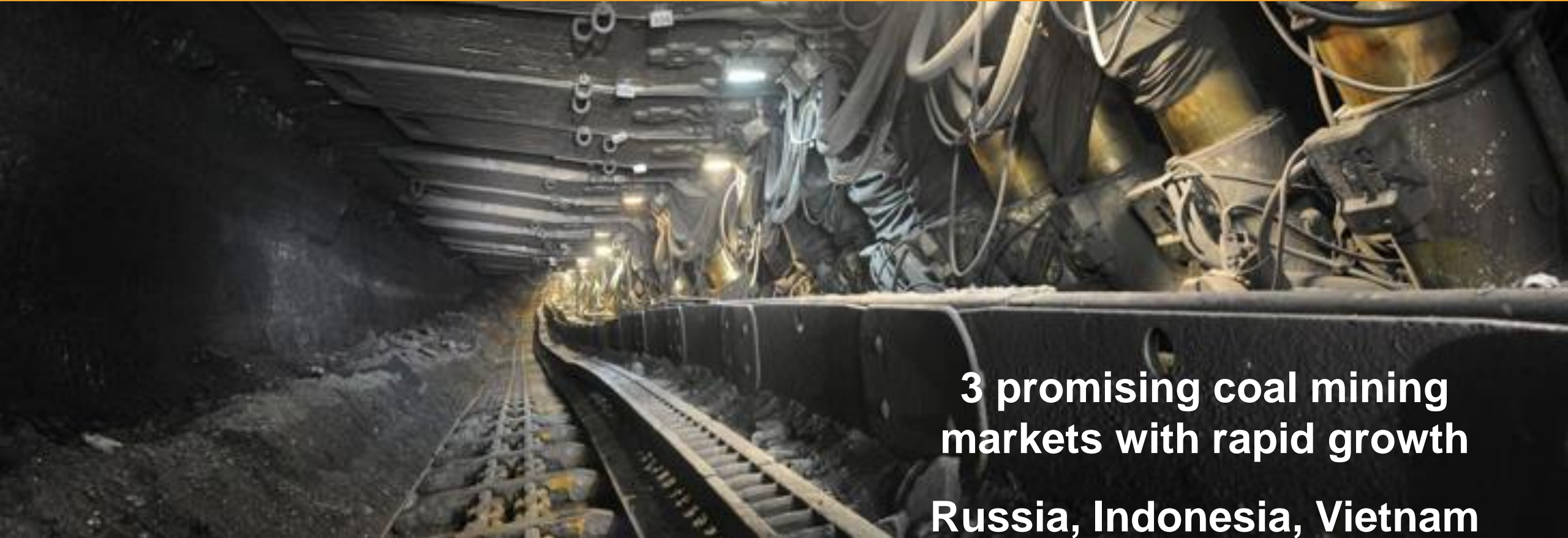


Noble metal minerals
Gold, silver

Premium customers in mining industry are always attracted and gathered by noble metal minerals.

Target Market: coal mines which are relied on by China in long-term

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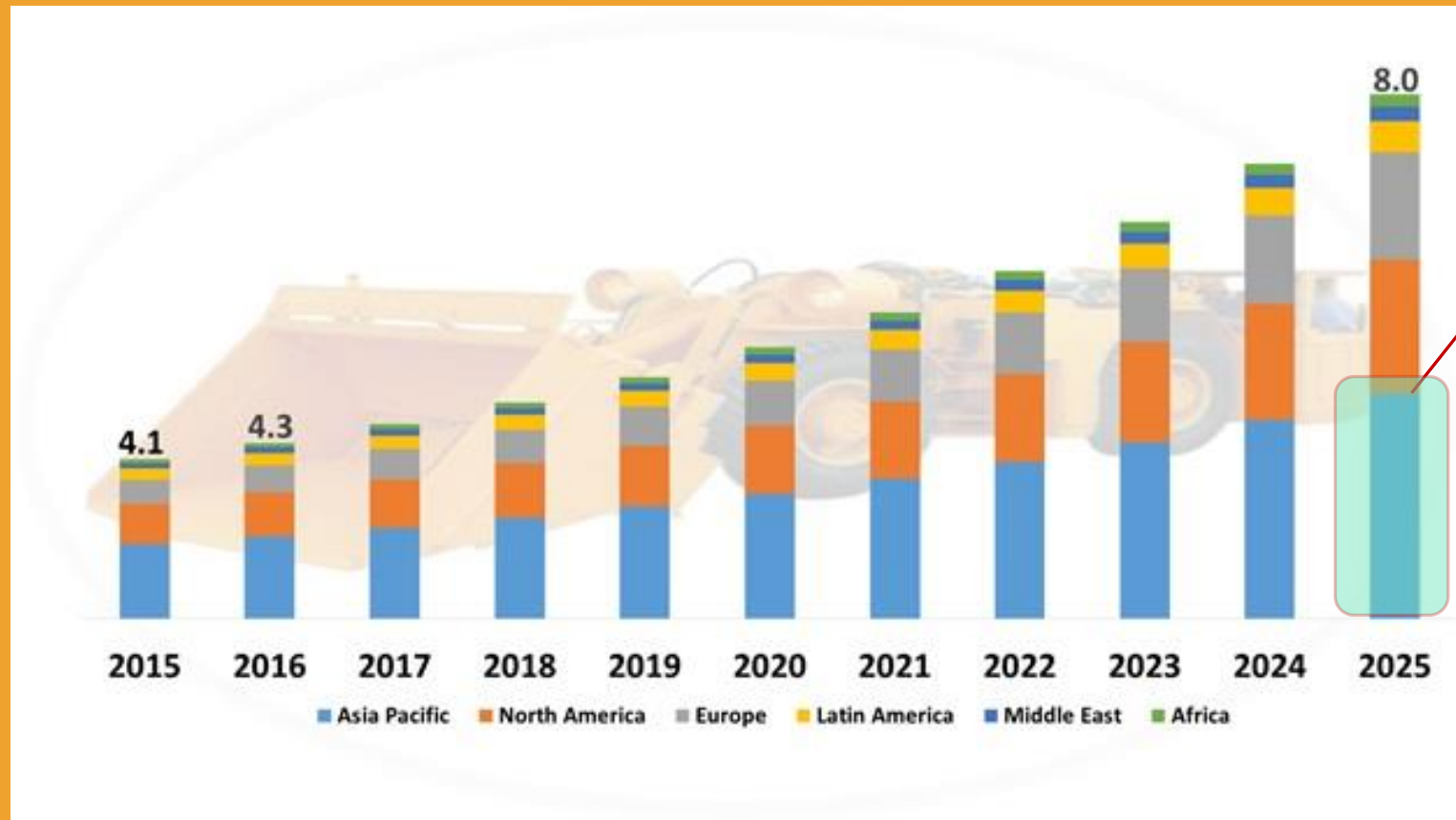
**3 promising coal mining
markets with rapid growth
Russia, Indonesia, Vietnam**

President Putin has signed protocol to revitalize coal industry; Indonesian coal industry is booming, Vietnamese industry is growing prosperously, it has become *Coal Net Importer*.

Core technology market space: underground trackless equipment

Global market compound annual growth rate (CAGR) has been 6.5% since year 2018. It's predicted that annual market volume will be \$8.0 billion by year 2025.

Among which Aisa-pacific area is the fastest and biggest.



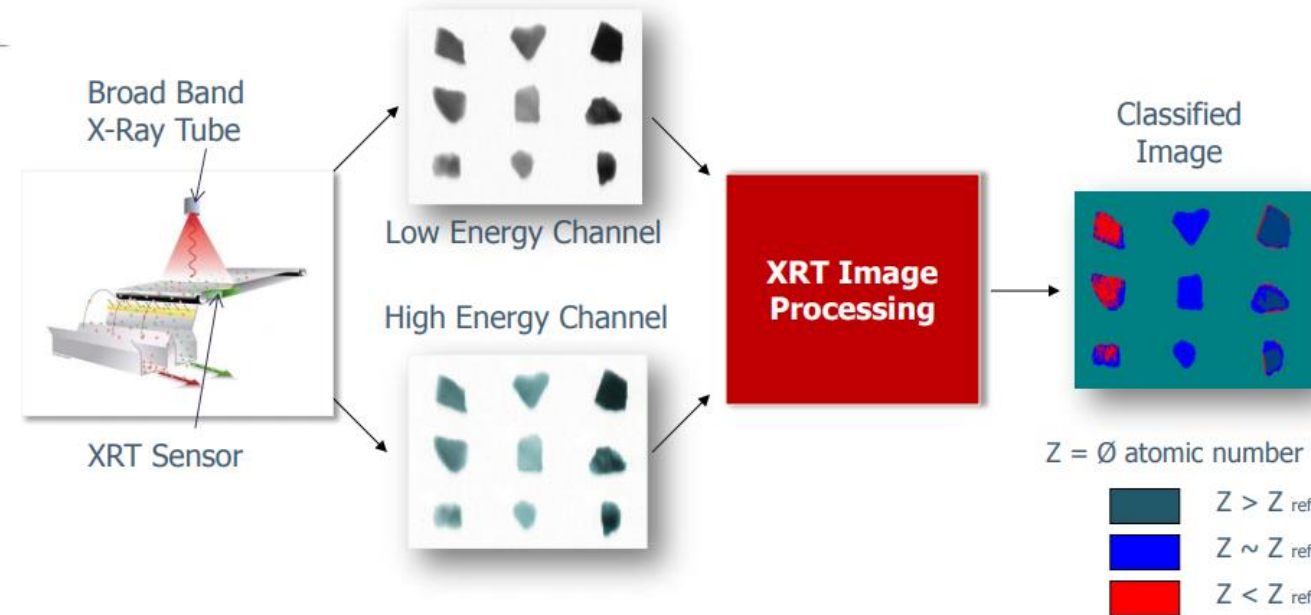
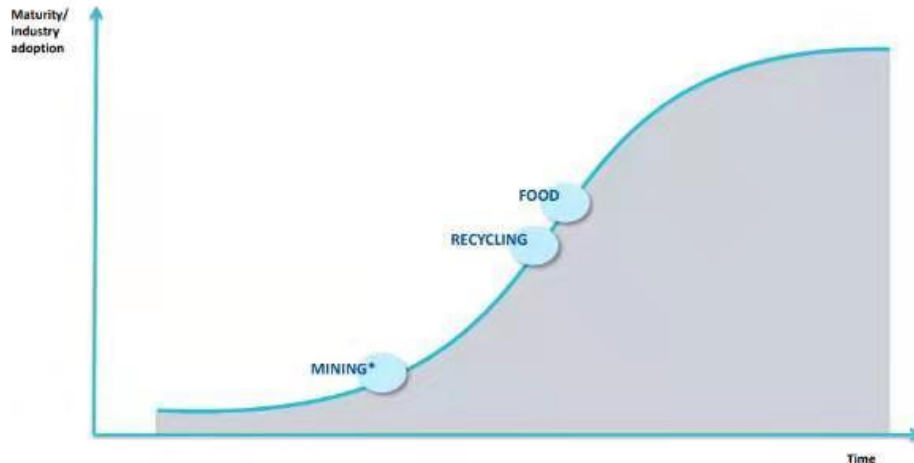
Asia-pacific area

Core technology market space: sensor-based XRT intelligent photoelectric sorting

It's foreseeable that by year 2024, annual global market volume will be \$3 billion.

This investigation doesn't consider strong & rapid growth of coal industry.

Adoption of sensor-based sorting at different maturity levels



It's just at very beginning that XRT applied in mining industry

XRT sorting principle

Professional service market space: consultancy, engineering and operation service

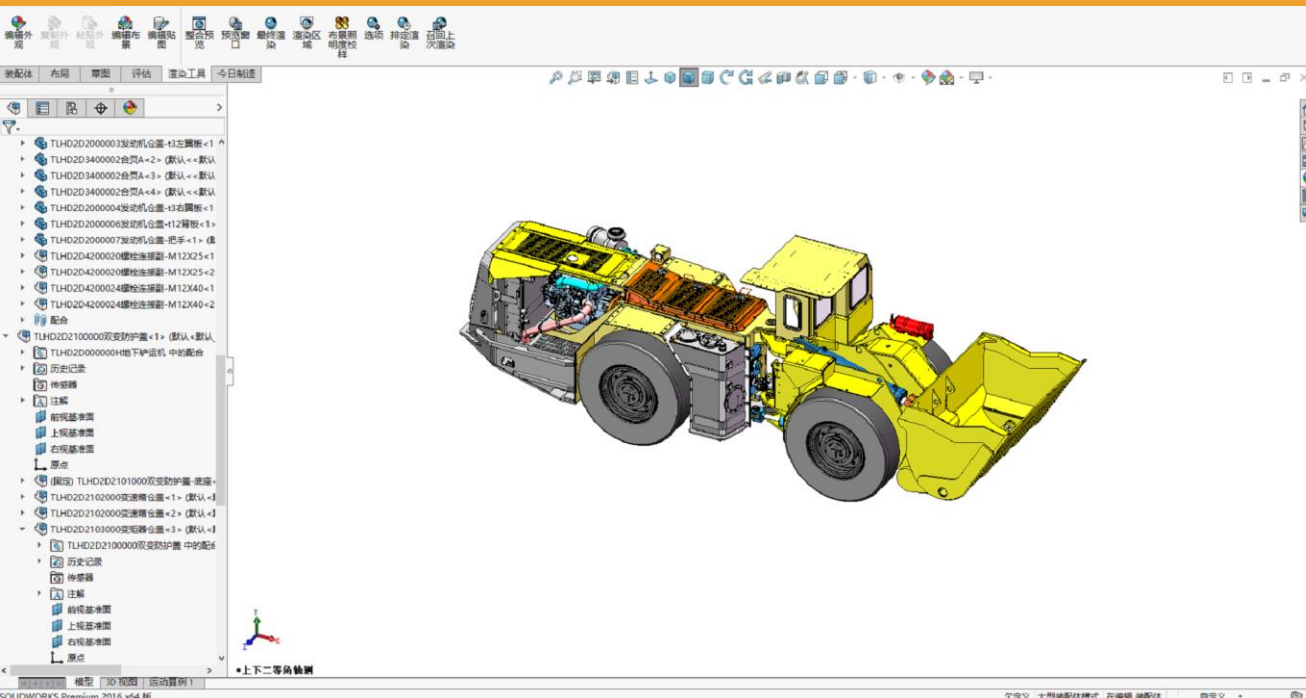


It's a tremendous market....

HOT orientation: to win 1 contracting contract with amount CNY100 million - 200 million annually.

As corporation growing, engineering contracting market will be HOT major target.

Competitive edge - technology

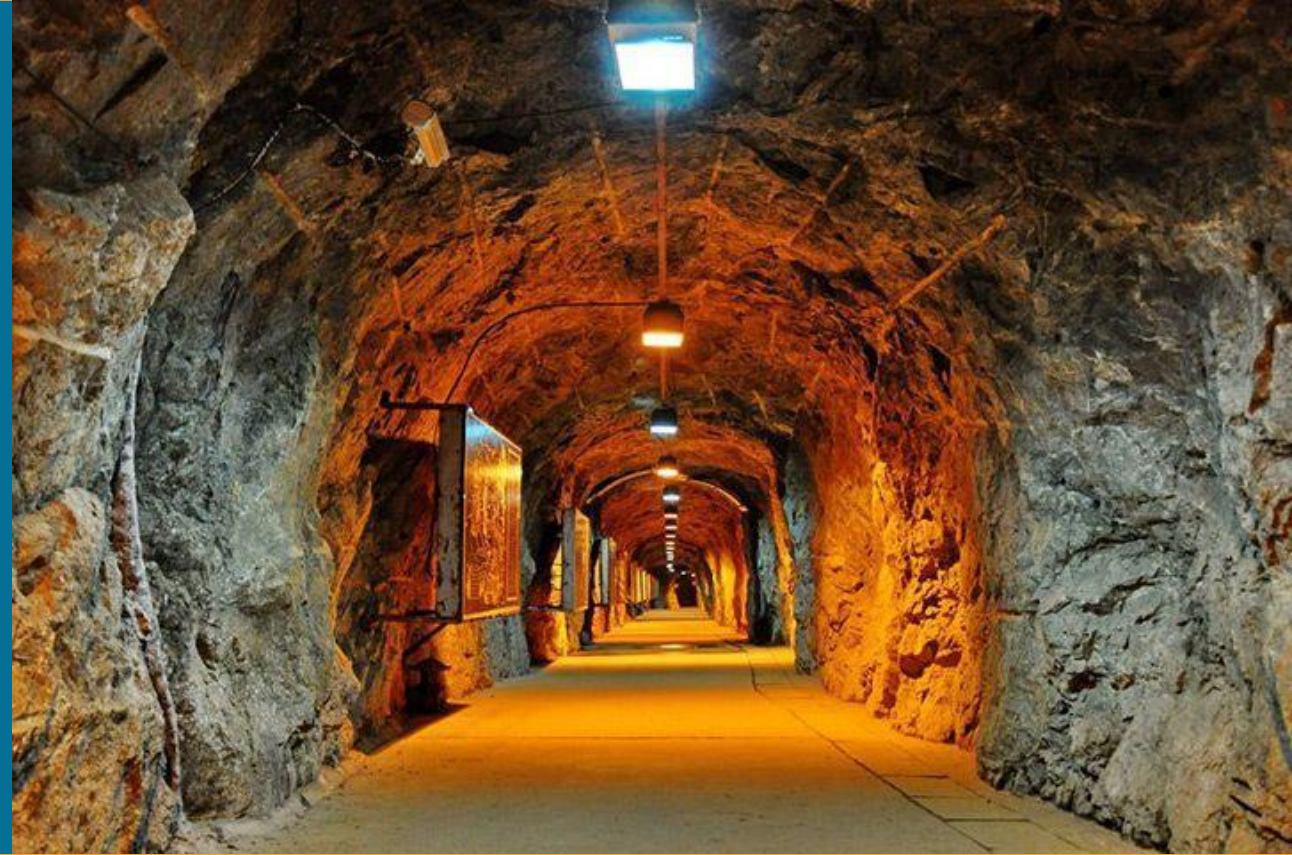


Competitor: equipment sales is an independent action (few of European/American leading enterprises have integrated industrial IoT and intelligent technologies)

HOT: system is trained each time equipment is started, and learns mutually. Performance is optimized to be better and better.

PdM system reminds users to purchase and prepare wearable parts in advance, to prevent from failure. Malfunction is alerted in advance and cleared with remote on-line technical guidance, in order to elevate customer experience, increase sales income and reduce ineffectual business travel costs.

Growth Magic Towards the Megatrends



THANKS !