

Energy & Utilities

# Extracting the power of AI

China Coal Huajin Group

China Coal Huajin Group teams up with Lenovo Research Institute to deploy a computer vision application that can automatically detect wear and tear on critical mining equipment, boosting the accuracy, efficiency, and safety of maintenance operations.



Lenovo

1

## Who is China Coal Huajin Group?

China Coal Huajin Group (CCHG) was incorporated in 2001 as a 50/50 joint venture of Shanxi Coking Coal Group and China Coal Energy. Today, state-owned China Coal Energy holds a 51% majority stake in the company.

CCHG operates four coal mines and three processing plants in Shanxi Province, with a total annual production capacity of 14.2 million tons of coal. The jewel in CCHG's crown is the Wangjialing Coal Mine, which produces around 16,000 tons of coking coal each day, and 6 million tons annually.




## 2

# The Challenge

Once cut, coal is transported from the underground mine face to the surface using a scraper chain conveyor. These scraper chain conveyors can be up to 20 kilometers in length, made up of a series of shorter three- to four-kilometer-long chains.

An essential piece of equipment in the modern coal mining process, scraper chain conveyors are susceptible to wear and damage. Over time, the scraper chains will deform and eventually break, bringing the entire conveying system to a halt, which can severely impact production. To reduce the risk of downtime, CCHG takes a proactive approach to maintenance, carrying out regular inspections of the scraper chain conveyors.



“We aim to identify and replace deformed chains before they break,” says Zhou Songyun, Technical Supervisor at CCHG. “Replacing a deformed chain is a relatively straightforward process that takes about 30 minutes. But if the chain is broken then we have to disassemble and reorganize the whole conveyor system, which can take 20 hours or more.”

Previously, a team of 200 people worked in shifts to inspect the scraper chain conveyors manually. Not only did this pose a number of safety risks for the employees, it also required a lot of experience and specialized training.

As part of China’s drive to accelerate the intelligent development of coal mines, CCHG is investing millions of yuan into intelligent transformation projects each year. The company saw the potential to automate the scraper chain conveyor inspection process, reducing its reliance on human judgement and minimizing the time that inspectors need to spend underground.

# Investing in AI

CCHG engaged the Lenovo Research Institute to develop a computer vision application that uses AI on camera streams to identify signs of wear and damage on scraper chain conveyors.

High-resolution 3D cameras on the scraper line capture the visual appearance of the chains from multiple angles to output a 3D point cloud. The application uses 3D visual image processing technology to measure the length of the scraper chains and detect abnormal chain ring length values based on shape analysis of the 3D depth images.

## Hardware


Lenovo ThinkSystem SR590 V2  
Lenovo Tab K10 tablets  
Lenovo Qi Tian M450 desktops

## Software

3D inspection platform for scraper chain conveyor  
High-precision detection algorithm for chain deformation  
Equipment control management software  
Remote client monitoring software

## Services

Lenovo Research Institute



The application outputs grayscale maps, 3D point cloud images, abnormal chain link length calculation values, and abnormal alarm information—all in real time. The maintenance team can view the inspection results and maps through mobile and desktop terminals, enabling them to pinpoint exactly where the defect is located and organize repairs effectively.

The computer vision application runs on an on-premises server cluster, consisting of six Lenovo ThinkSystem SR590 V2 servers. CCHG also deployed Lenovo Tab K10 tablets and Lenovo Qi Tian M450 desktops to serve as remote access terminals for the maintenance team.



**“The Lenovo team spent four months developing and training the algorithm to ensure accurate chain link length calculation and fault detection. The algorithm is accurate to 1 millimeter, which we are very pleased with.”**

**Zhou Songyun**

Technical Supervisor, China Coal Huajin Group

# 3

## Results

Since deploying the computer vision application, CCHG has dramatically improved the accuracy, efficiency, and safety of its maintenance operations.

Zhou Songyun elaborates: “The coverage rate of a single chain defect detection abnormality increased to more than 95%, while the daily maintenance coverage rate increased to more than 99%. This means that we catch defects early and can replace the deformed chains before they break—avoiding costly outages that impact production.

“What’s more, by automating the inspection process, the maintenance team spends 90% less time underground. Rather than going down to make regular inspections of the scraper chain conveyors, they only go down occasionally when repairs are needed. Spending less time in hazardous areas has massively improved worker safety.”



>95% coverage rate of a single chain defect



>99% daily maintenance coverage



90% less time spent underground by maintenance teams

# Why **Lenovo**?

With \$1.3 billion invested in research and development in the last financial year, Lenovo is at the forefront of innovative thinking.

“Lenovo leads the way in smart manufacturing, and we wanted to harness this innovation to support the intelligent transformation of our mines,” says Zhou Songyun. “The Lenovo Research Institute invested a lot of energy in this project. We were impressed by the dedication of the team, and by how quickly they were able to develop and deploy the solution.”





# How can you make mine maintenance operations safer?

Engaging the Lenovo Research Institute to develop a computer vision application that automates the inspection process.

[Explore Lenovo Research and Innovation](#)