



Editor's Note

Spring Festival, also known as the Chinese New Year or Lunar New Year, is the grand festival in China. In celebration of the 2024 Spring Festival, Science and Technology Daily reporters visited some regions to cover their robust development and real life of the grassroots. We would like to share with our readers a picture of a beautiful China.

Rail Navigation System Upgraded to Keep Travelers Safe

By CHEN Chunyou & WEI Yichen

China's Spring Festival travel rush is considered the largest annual human migration in the world. China's transport network, high-tech and comprehensive, has made going home for the much-awaited annual family reunion convenient and time-efficient for millions of travelers.

It is well-known that Fuxing, dubbed the "bullet train", can cover more than 5,800 meters in one minute. However, not many know about the "brain" behind this high speed marvel — the automatic train protection (ATP) system that guides the train.

The ATP system receives real-time information about the road conditions ahead through its speed sensor and antenna and provides voice prompts for the driver, Xiong Yuhao, a staff at a maintenance base of Nanchang East Railway Station in Jiangxi province in east China, told *Science and Technology Daily*.

The ATP system automatically controls the high-speed train so that it runs safely at a specified speed during bad weather, such as typhoons and heavy snow. "So it is very important for driving," Xiong added.

When the parameters of the bridges, tunnels, curves and other facilities on the train route change, the navigation data has to be updated accordingly to adapt the train to the new driving environment.

After a train arrived at the station, Xiong and his colleagues started the maintenance work to debug the train's equipment and upgrade the navigation accuracy.

He opened the door of the navigation cabinet at the back of the cab, removed the integrated navigation "chip", and began importing the reset software program to upload the data.

When the progress bar on the screen jumped to 100 percent, Xiong hit the keyboard to enter the instructions and called out the corresponding navigation mod-

ule to test whether the function was normal. Lines of data code constantly popped up, and rows of indicator lights flashed up and down. "Each item must be repeatedly checked," Xiong said.

The total data that had to be upgraded at that time amounted to nine million characters. Xiong called it "equivalent to the total number of characters in a small library's book collection".

"If there is data deviation, the train will be delayed. Even if it is by one minute, it may have a major impact on the overall rail transportation," he explained. To make the uploading accurate and smooth, Xiong watched the display screen like a hawk so that he wouldn't miss any detail, however small.

In addition to data updating, Xiong has to ensure that the navigation system is not malfunctioning. If there is a glitch and it is not dealt with in time, it will delay the departure of the train.

To improve his emergency response ability, Xiong has learned circuit programming by himself. He used to copy the professional term codes over and over again to form a muscle memory. "High-speed train navigation needs frequent upgrading, so our technical skills have to keep up," he said.

The passenger flow is expected to rise this Spring Festival holiday. The railways have increased the number of night high-speed trains and trains on popular lines to meet the growing travel needs, which means the navigation maintenance workload has doubled.

Xiong and his workmates had to update the navigation data for more than 60 high-speed railways from 6 pm the previous day to 8 am that day. However, they said they didn't feel tired.

"These high-speed trains go to faraway places, taking people home for family reunions. When they reach home safely, we feel relieved," he said proudly, looking at the bullet trains leaving the depot.

Accurate Weather Forecasts for National Winter Games

By LI Linxu & FU Lili

The Spring Festival has begun, while the opening ceremony of China's 14th National Winter Games is also about to lift the curtain.

The Games, which will officially kick off in Inner Mongolia autonomous region on February 17, will be the largest of its kind with the participation of more than 3,700 athletes.

To ensure smooth running of the Games, thousands of volunteers, workers and staff are ramping up preparation efforts for the Games, including weather forecasts.

Snow sports are quite dependent on meteorological conditions, said Shi Shaoying, deputy director of the Inner Mongolia Meteorological Observatory. If the temperature is too cold, it will not only affect the physical mechanism of athletes, but may lead to athletic injuries. Besides the temperature, the wind velocity, visibility and quality of snow also have an impact on athletes' performance.

To provide precise weather forecasts for the Games, the meteorological service team is leveraging the experience of the Beijing Winter Olympics in light of local conditions.

"Each site has its own temperament, so we have to get familiar with it as soon as possible," said Wang Ying, deputy director of the Hulun Buir Meteorological Observatory, and the person in charge of weather forecasts for the competition area of Zhalantun.

The area, located in the southeastern foothills of the Greater Khingan Mountains, will host events such as ski mountaineering, freestyle skiing and snowboarding.

Fifteen automatic meteorological monitoring stations, a laser anemometer radar, and a microwave radiometer have been set up at key points of the area to record real-time changes of meteorological elements at minute scale.

Since last December, the team members have been walking along the venues daily to inspect the stations, note the wind variations, and observe the cloud changes.

For a qualification competition recently held in the area, they precisely predicted the starting and ending time of a snowfall, with only 0.1 millimetre variance in the magnitude of rainfall forecast.

As the Games are just around the corner, the team is ready to provide precise weather services for the participants.

Modern Tech Adds Flavor to Chinese Oolong Tea

By ZHONG Jianli, FU Xiaobo & LIU Zimo

When looking for the perfect Spring Festival gift, what springs to mind? Tea fits the bill to a T.

Originating in China some 5,000 years ago, tea stands as a symbol of hospitality and goodwill. Now it is forging closer bonds between Chinese on both sides of the Taiwan Strait.

Chen Lianfeng, a tea entrepreneur from China's Taiwan, was pouring golden-yellow tea into delicate cups at the 2024 Cross-Strait Tea Culture Festival held in Xiamen, Fujian province, on January 19.

"We hope to offer everyone the finest tea with the highest quality," Chen said.

This year marks Chen's ninth year of business on the Chinese mainland. In 2015, he relocated with his family to Yongfu, a town in Fujian's Zhangping city. The latitude and moist mountainous climate there are similar to the environment of the Alishan Mountain Range in Taiwan, making it an ideal place for cultivating high-mountain oolong tea.

Chen established a tea cooperative locally, integrating modern equipment, tea garden management and marketing with local production, bringing superior oolong varieties from Taiwan. Currently, the cooperative has 113 members.

"We have adopted modern technologies to place a premium on the quality and flavor of the tea," he said. The advanced automated irrigation system, capable of self-detecting humidity, coupled with an automatic fly-

catching system that has markedly reduced the need for chemical pesticides, ensures both efficiency and safety.

The use of various technological advancements on the standardized tea processing line, such as full-daylight withering devices for the oolong tea, novel indoor tea withering machines and automated tea leaf sorting, has significantly improved the controllability of tea production.

"Mechanized production saves costs and enhances production efficiency and hygiene standards. For instance, while a worker can pack only 20 to 30 pounds of tea leaves a day, in our packaging process, a single machine can pack over 100 pounds," Chen said. "Modern mechanized production is likely the future trend of the tea industry, and we hope to pass the cost savings on to consumers, giving more people the opportunity to enjoy affordable high-quality tea."

Chen's cooperative is exploring more marketing channels, particularly e-commerce, and has launched flagship stores on online trading platforms.

Thanks to his efforts, numerous households on the mainland are drinking Taiwanese high-mountain oolong tea. In 2021, the cooperative's tea products received the "Most Popular Spring Festival Gift Award" at the 14th Cross-Strait Agricultural Products Fair in Quanzhou.

To Chen, the tea is more than a cuppa. "The fragrant oolong tea is a link bridging the two sides of the Taiwan Strait, which share the same origin and kinship," he said.

Zero-carbon: a New Calling Card for Village

By CHEN Chunyou & HAN Rong

In Zhang Baomin's home, the lights, television, induction cooker, electric kettle, heaters and other electric appliances all run on solar power, even the agricultural equipment in his apple orchard, such as weeders, electric saws and sprayers.

Zhang lives in Zhuangshang, a village in Yuncheng city, Shanxi province in north China. When we walked into the village after a snowfall, the sign "China Zero-carbon Demonstration Village" at the entrance was particularly eye-catching in the snow.

Zhuangshang was awarded the title by the Global Environment Facility, the United Nations Development Programme, and China's Ministry of Agriculture and Rural Affairs in April 2023. In the past, people's first impressions of this village used to be "remote" and "ancient", but now it is being widely talked about for its zero-carbon initiative.

Zhang and his wife were preparing the Spring Festival holiday food for the family and guests in the kitchen, including fried oil cakes and fried doughnuts. An assortment of household appliances bubbled away on the stove. A black rectangular device below the power socket, connecting the power cord, caught our attention.

"This is an arc-extinguishing module attached to the photovoltaic (PV), energy storage, direct current (DC) and flexibility (PEDF) distribution system installed in the village. It ensures the safe use of the DC generated by the distribution system for household appliances," Zhang told *Science and Technology Daily*.

The transformation dates back to 2019 when the Shanxi Guochen DC Power Distribution Engineering Technology Co. and a research team led by academician Jiang Yi from Tsinghua University jointly piloted the technology in Zhuangshang's 27 households, with an in-

stalled capacity of about 250 kilowatts.

To put it simply, the PEDF distribution system refers to laying PV panels on the roof of each house to provide flexible services for the external power grid, according to Han Yufei, office director of Shanxi Guochen.

The electricity generated by these households not only meets their basic daily needs such as cooking and heating, but the surplus power can also be used for Internet surfing and transportation.

Zhang pointed to a large rectangular iron box on the bedroom wall. Commonly known as the "DC power supply," it was a multi-terminal energy router. "The iron box below is for on-site energy storage," he said. "The excess PV power that is not used during the day is stored through it, storing 10 kWh of electricity per day, which is enough for use at night."

Because of the low-carbon initiative, life in Zhuangshang has undergone new changes. The villagers are concerned not only about their crop yields but also care about the environment.

"In the past, we went to town by oil-consuming tricycles, which emitted black smoke. It costs over 10 RMB for a round trip of 40 kilometers. Now, with electric tricycles, it only costs a little over 2 RMB," Zhang said.

The village is also transforming its abandoned cave dwellings into PV courtyards, and barren slopes and wasteland into PV corridors.

According to official statistics, as of January 25, the PEDF distribution system in Zhuangshang had generated revenue of more than 1.5 million RMB, saving over 1,900 tons of standard coal and reducing carbon dioxide emissions by 4,900 tons.

Zhang has new plans for the Lunar New Year. "The air conditioners and kitchen hood at home are old items bought a few years ago and don't support the use of DC power," he said. "I will buy some latest appliances after selling the apples from the orchard so that it is more convenient to use this clean electricity."

