

CASE STUDY

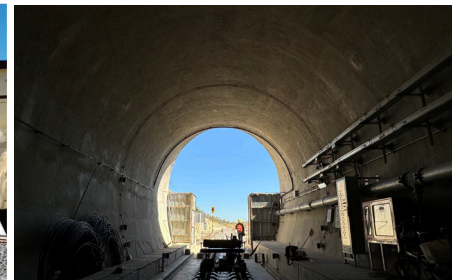
Project : Double Track Railway Map Kabao - Thanon Chira Junction (Thailand)

► GENERAL INFORMATION

Client	: ITD - RT
Year	: 2021
Location	: Saraburi - Nakhon Ratchasima Provinces, Thailand
Infrastructure type	: Railway Tunnel
Equipment supplied	: Tunnel Jet Fan, 88 units
Total ventilation Power	: 3256 kW

► PROJECT OVERVIEW

The State Railway of Thailand (SRT) has been actively engaged in enhancing Thailand's transportation infrastructure since 2015. The primary objectives of these efforts are to minimize travel time, alleviate traffic congestion, and establish seamless connectivity between regional transport networks, extending even to neighboring countries.



The Mab Kabao -Thanon Chira project, with a budget of 600 million USD, represents the first phase of the Northeastern Double Track Railway Project in Thailand. This particular phase covers a distance of 136 km, starting from Saraburi and extending to Nakhon Ratchasima. Due to the mountainous terrain of Nakhon Ratchasima, the construction of three tunnels was necessary for this phase. These tunnels are as follows: 1. Tunnel 1: Length - 5.85 km. 2. Tunnel 2: Length - 0.65 km. 3. Tunnel 3: Length - 1.4 km.

By incorporating these tunnels into the railway alignment, the project aims to overcome challenging geographical obstacles and provide a more efficient and effective transportation solution for the region.



► VENTILATION SYSTEM

In the case of the 1.4 km. and 5.85 km. railway tunnels, relying solely on natural ventilation and the piston effect created during train transit is insufficient to maintain adequate airflow. As a solution, jet fans have been selected for the ventilation system. However, installing them within the limited space available due to tunnel geometry and train size presents a significant challenge. Hence, the project calls for the utilization of high-performance jet fans that are customizable and capable of producing substantial thrust while still being compact enough to fit the available space and be installed in appropriate locations.

► PROJECT MILESTONE



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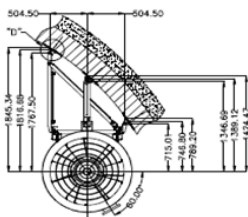
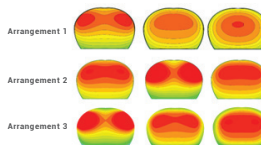
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► KRUGER'S SCOPE

■ Supporting in design:

At Kruger, we offer more than just fan supply services. We are committed to actively participating in every stage of the process to enhance ventilation solutions for our customers and end-users. This commitment extends to providing support during the design phase.

Through the utilization of CFD simulation and analysis conducted by our team of experts, we can identify the optimal conditions for the ventilation system in this project. This includes determining the appropriate quantity of fans, their sizes, and the ideal locations for installation.



■ Product Customization:

Our commitment to excellence in ventilation solutions is reflected in our customized products. Each of our jet fans is meticulously designed to perfectly fit the dimensions and environment of the specific tunnel, ensuring optimal performance and reliability. Our mounting structures are thoughtfully crafted, taking into account factors such as the tunnel ceiling and the safe distance required during fan operation and train transit.

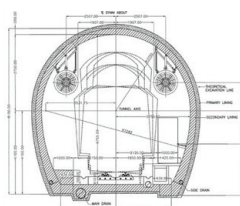


For this project, the mounting structures are designed using finite element analysis and engineering calculations. This ensures that the fans are securely positioned, considering the tunnel ceiling and maintaining a safe distance when the fans are in operation and trains are running through.

Our jet fans are engineered with precision using carefully selected materials that are specifically designed to withstand the demanding conditions within tunnels, including high temperatures during fire incidents. These materials have been rigorously tested and certified by TUV SUD in accordance with EN12101-3 standards. Additionally, we provide accessories and sensors tailored to the customer's specific requirements and use cases.

■ Mock-up unit:

In order to streamline the installation process and offer valuable support to our customer, Kruger took the initiative to design and prepare a mock-up unit that accurately replicated the dimensions of the final product. This enabled the contractor to adequately prepare the installation site, ensuring a smooth and efficient installation process.



■ Factory Acceptance Tests (FAT):

Kruger always focuses on reliability to give customers confidence. We have one of the largest AMCA-accredited laboratories to test fans according to international standards.



The tests conducted for this project included:

- Thrust performance test according to AMCA 250
- Sound performance test according to AMCA 300
- Vibration, Tri-axial strain gauge, Reversal, 24 hrs, and Natural frequency tests.



Due to the Covid-19 pandemic situation in 2020, local restrictions caused a delay in the project. To ensure timely completion of this project, Kruger provided a solution by conducting online testing. We set up a conference room for the customer in Saraburi and performed the FAT at Kruger's laboratory.

■ Installation & Commissioning:

With manufacturing plants worldwide, Kruger can support customers by sending specialists who have a deep understanding of our products to assist with installation, commissioning, and provide after-sales services.

In this particular project, we deployed specialists from Kruger Ventilation Thailand to provide on-site support during the installation and commissioning process.



► CONCLUSIONS

The Kruger Tunnel jet fans have successfully undergone meticulous design, testing, and installation processes. These efforts have significantly enhanced life safety within the tunnel while effectively meeting the customer's satisfaction.



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