

CASE STUDY

Reliable Underground Monitoring of Tunnel Excavation in Central Copenhagen

PROJECT TYPE: Drainage tunnel excavation monitoring

COUNTRY: Denmark

INDUSTRY: Tunnel

MAIN PRODUCTS:

- 1 Ackcio Gateway (BEAM-GW)
- 2 Ackcio Vibrating Wire Nodes (BEAM-VW-S8)
- 3 Ackcio Analogue Nodes (BEAM-AN-S4)
- 4 Ackcio Analogue Nodes (BEAM-AN-S1)



CHALLENGE



A rainwater drainage tunnel being dug in central Copenhagen runs under some of the city's busiest sites and most famous attractions. The tunnel, which is approximately 1,265 metres long, extends from the southwest corner of the Sankt Jørgens Sø lake to the channel at Kalvebod Brygge, a popular waterfront area. Along the way, it passes beneath landmarks such as Det Ny Teater; Vesterbro Torv, a busy public square; Gasværksvej Street; and Kødbyen, the city's flourishing meatpacking district.

Monitoring of the project was required by authorities and building owners who were concerned about potential risks related to the tunnelling. Without a solid monitoring plan, the project would not have been approved.

SMT Nordic, a Danish company specialising in monitoring, inspections and visualisation that provides full-service, intelligent monitoring solutions, is conducting monitoring on the project, tracking the differential settlements in depth during tunnelling, settlement above the tunnel, as well as structural monitoring on buildings above the tunnelling works and the project's three shafts.

To ensure the safety and stability of the buildings and other infrastructure in the busy urban areas above the tunnel, SMT needed a reliable monitoring solution to provide a real-time picture of what was happening underground.

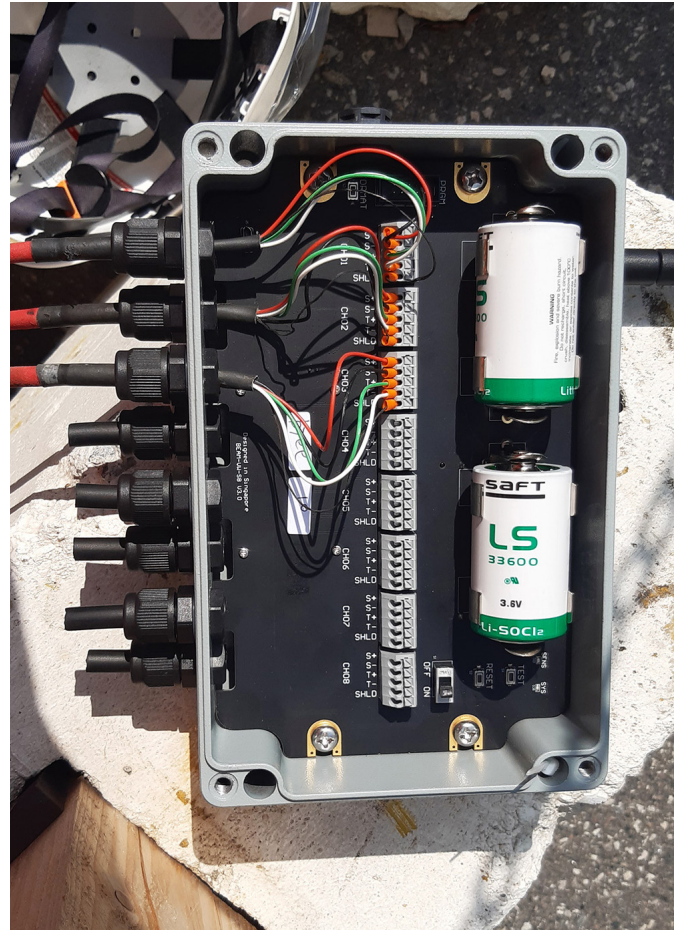
SOLUTION

SMT chose the Ackcio Wireless Beam System for the reliability and coverage of its network, relatively low cost and proven track record in underground worksites.



Thanks to its unique mesh topology, Ackcio's Nodes form a network in which each Node can also act as a repeater, overcoming the limitations of more traditional monitoring technologies. LoRa devices would likely have needed three gateways, and may have had coverage challenges. And standalone loggers with GSM communication would have cost more to run, as each logger would have needed its own SIM card.

In the project, which is expected to last for approximately three years, SMT deployed Ackcio Nodes to measure two convergence sections installed in an old sewer tunnel near a shaft at Skt. Jørgens Sø and extensometers along the tunnel alignment. They also installed 17 units of 3-Rod and 4-Rod extensometers along the tunnel alignment of the project. SMT is using six Ackcio Analogue Nodes and two Vibrating Wire Nodes to provide measurements, as well as five Nodes as repeaters to extend the range of the network.

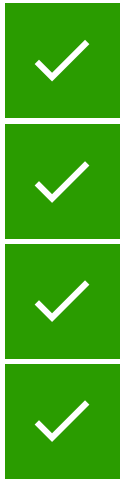


The Nodes are primarily installed in sections of 3-4 Nodes, with the greatest distance between sections being around 400m.

In the project's next phase, SMT will deploy approximately 14 units of 4-sensor and 7 units of 1-sensor Analogue Nodes and 2 units of 8-sensor Vibrating Wire Nodes to measure instruments installed in manholes. Eight or nine 1-sensor Analogue Nodes will be used above ground as repeaters to transmit the measurements to the Gateway.

The Ackcio solution is providing reliable data streams from the underground site. Along with overcoming the costs and challenges of other solutions, SMT has been impressed with Ackcio's customer support and service and how straightforward and user-friendly its system was to set up and configure. SMT plans to use Ackcio products in upcoming projects.

RESULTS



Remote, real-time data access

Reliable, stable readings

Increased infrastructure, building safety

Improved risk management



BENEFITS



Reliable, real-time
underground readings



Lower
cost



User-friendly
configuration,
deployment



Excellent support
and service



TESTIMONIAL

Ackcio provides robust wireless data acquisition solutions in areas where several instruments are concentrated in a relatively wide area.

— **Antonis Charalampidis,**
Geoteknisk Specialist
SMT Nordic ApS



ABOUT SMT NORDIC At SMT Nordic, we are specialists in monitoring, inspections and visualization. We deliver full-service packages with everything from development, installation, maintenance, alarm system, data visualization and documentation. We create monitoring systems according to each customer's needs, ensuring they get the right information at the right time to make the right decisions during their project's planning and implementation.



ABOUT ACKCIO Ackcio builds reliable wireless data acquisition systems for industrial monitoring applications. The company automates monitoring processes and provides remote, intelligent data to enable increased safety and efficient risk management in mission-critical industries, including construction, infrastructure, mining, and rail. Ackcio's flagship solution, Ackcio Beam, is an industrial data acquisition platform that uses a patented long-range wireless mesh network to monitor sensors accurately and reliably in both above-ground and underground environments. Ackcio is headquartered in Singapore and supports clients across the world. In 2021, the company was included in Forbes Asia's inaugural '100 to Watch', a list of small companies and startups on the rise across Asia Pacific.

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