concrete sensors BY HILTI

KIBAG VBZ
CASE STUDY





Introduction

KIBAG is a leading Swiss building materials and construction company with over 2000 employees. With 21 concrete plants, 13 gravel plants, its own accredited construction materials laboratory, and 17 construction companies, Kibag offers a comprehensive range of services in the business areas of construction materials, construction services, and recycling and waste disposal. In addition, Kibag is committed to sustainable and resource-conserving construction, particularly in the areas of general traffic route construction, as well as in the development of carbon-reduced building materials.

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CONCRETE MONITORING



CONCRETE MONITORING IN THE LIMMATALSTRASSE/ HÖNGERSTRASSE PROJECT FOR VBZ (VERKEHRSBETRIEBE ZÜRICH)

The project shown here is an approx. 1.5 km long tramway section for which a total of more than 1000 m3 of UHD concrete (Ultra High Density Concrete) with an already reduced CO2 footprint was delivered and installed.

In such projects, reliably opening the newly repaired and concreted road surfaces on time minimizes disruptions to traffic and residents.



Left to right: Sascha Lothert, Kibag Project leader; Simon Rümmele, Hilti Concrete Sensors; Stefan Vogt, Kibag Head of Innovation & Projects

Temperature and strength development of concrete can now be measured directly on the construction site

To record the temperature and strength development in the freshly produced concrete cross-section, the Kibag team, in consultation with the client, decided to use Hilti Concrete Sensors, an innovative concrete monitoring solution in which the strength development of the concrete (derived from the heat of hydration) can be retrieved in real time under real construction site conditions.



During the setting and hardening process (hydration) of the building material concrete, heat is generated in the structure, which is significantly influenced by the thickness of the component, the composition of the concrete type, but also by the exposure to weather, ambient temperatures, shading or solar radiation. Higher concrete temperatures lead to faster strength development. **Using Hilti sensor technology, a relevantly faster early strength development of the concrete was repeatedly demonstrated over a project period of several months.**

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THE RESULTS



Quality and productivity

“Achieving the desired strength at the desired time is crucial for scheduling. The sensors provide updated data every 15 minutes and thus allow a very accurate estimation of the temperature and strength development in the real component. This means that construction processes can be controlled even more precisely and quickly, and the requirements of the building owners can be met with the highest quality.“

– *Stefan Vogt, Head of Innovation and Projects at KIBAG Management AG states,*

Kibag and its client were able to optimize the concreting sequence in terms of time thanks to reliable real-time data and to significantly reduce the high effort required for the preparation and testing of specimens.

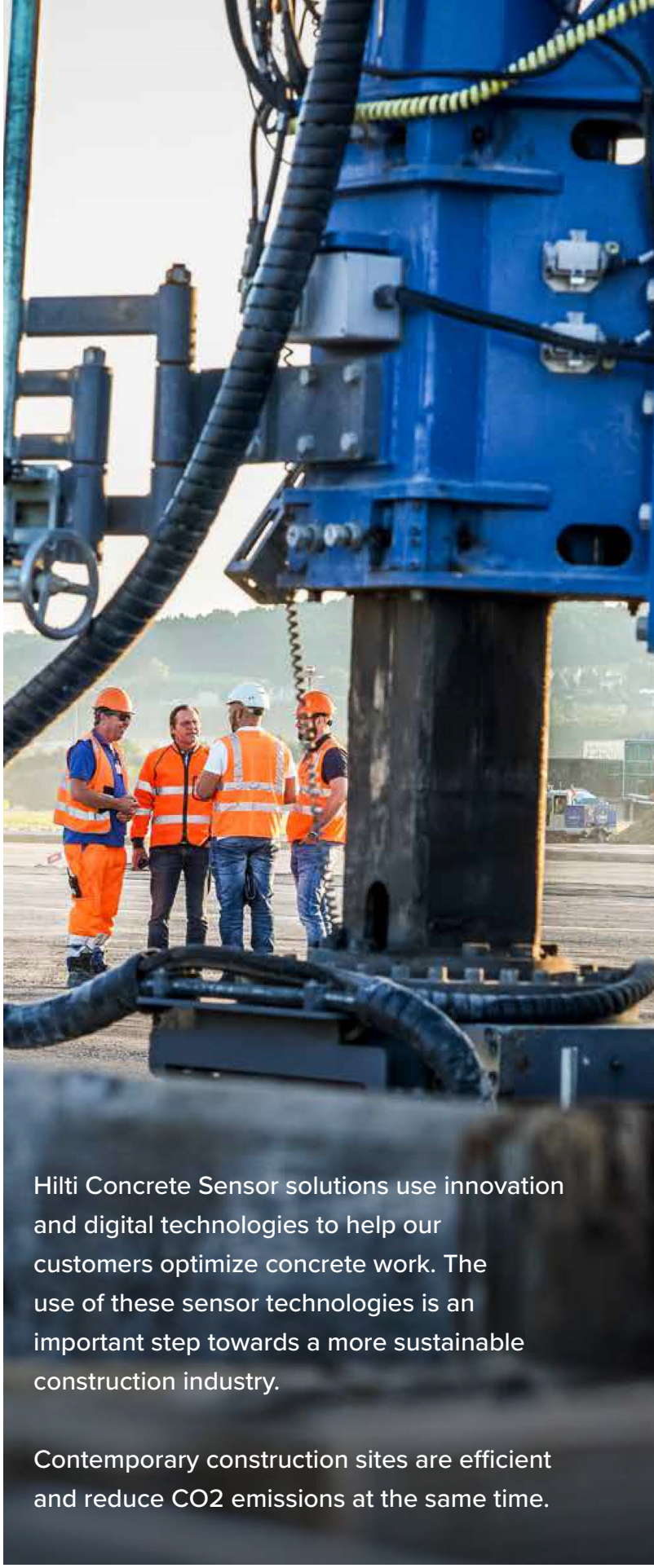


Sustainability

Based on the sensor data analysis, Kibag is able to define sustainably modified concrete formulations for future concreting sections, which allow cement savings of more than 20% without negatively affecting the durability characteristics.

“The originally specified and selected concrete recipe exceeded the design requirements in terms of early and final strength, especially at high temperatures. Here, the sensors provided important real-time data and helped to select the most suitable concrete recipe. Combined with Kibag’s innovative, low-carbon UHD concrete, the sensor technology again significantly reduced the concrete’s carbon footprint over long periods of time.“

– *Stefan Vogt, Head of Innovation and Projects at KIBAG Management AG states*



Hilti Concrete Sensor solutions use innovation and digital technologies to help our customers optimize concrete work. The use of these sensor technologies is an important step towards a more sustainable construction industry.

Contemporary construction sites are efficient and reduce CO2 emissions at the same time.

The majority of emissions in the construction sector come from the consumption of resources, particularly in the production of steel and concrete. Implementing sustainable practices in construction projects requires a multi-faceted approach, ranging from improving resource efficiency to increasing energy efficiency to advanced end-of-life management.

Hilti Concrete Sensors offers unique services, hardware and software for real-time monitoring of concrete. The system complies with the ASTM C1074 standard for determining concrete strength by the maturity method and is approved to perform critical construction and requirements.

ANALYSIS PERIOD CASE STUDY	**02/2023 until 07/2023**
M3 concrete used	1.000m3
Potential Cement reduction (summer months)	20%
Cement Savings potential over total construction time	**80.000 Kg**
CO2 reduction potential	**72.000 Kg**
Cost savings test cylinders	**2.000 CHF (≙~2.300 USD) per concreting shift**

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