**Construction 4.0. – going digital with Concremote**

**Higher productivity and measurable successes with innovative concrete-sensor technology**

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|  | Concremote determines the optimum time for stripping the formwork, increasing productivity.  Doka\_201611\_Concremote\_01.jpg  Photo: Doka GmbH |

Digitisation yields the crucial advantage in construction. Studies indicate that even today, as much as 57 % of the work in construction generates no added value, due to mistakes and shortcomings, waiting times and search times, lack of harmonisation across construction routines and poor communication. In future, digitisation could unlock all this potential. Innovative technologies are the key. The best example is Concremote – a modern-day product of digitisation – a technology that Doka has already deployed on more than 100 jobsites. Concremote determines the optimum time for stripping the formwork, increasing productivity. So with Concremote, Doka contributes significantly to Building Information Modelling: BIM is the interactive, end-to-end process optimisation over the entire life cycle of a structure.

The sensor-based solution returns data on the temperature and strength development of in-situ concrete in real time, vital information for the construction process. The use of Concremote can normally shorten the construction cycle on the core build of a typical 47-storey highrise by a day per storey, resulting in a 20 % increase in productivity.

Concremote has a very wide operating range. As proved at temperatures down to minus 40 Celsius on the Muskrat Falls project, Canada's second largest hydroelectric facility, and during construction of the Highpoint tower in London. On many projects, Concremote helps in ascertaining whether the concrete mixture originally planned is suitable or should be optimised, to find the earliest possible formwork stripping time and to shorten cycle times. And it is also a reliable tool for documentation, which can be of great benefit in cases of liability.

***Measurable successes in real time***

By transmitting real-time data, Concremote makes successes more measurable and formworking and cast-in-place concreting more effectively schedulable. Concremote uses two types of sensors to collect data: wireless slab sensors that are inserted into the fresh concrete as soon as the slab has been screeded, and cable sensors that are installed directly into the form-ply of the wall formwork.

At regular intervals the sensors measure the temperature development of the fresh concrete and transmit the data to the Concremote data centre of Dutch technology company B|A|S, a wholly-owned subsidiary of the Doka Group since July 2016. The centre computes standards-compliant analyses of the strength development of the concrete and returns the digital data back to site in real time. The data can be called up through a secure web portal anywhere and at any time with a notebook, tablet PC or smartphone. Early strength data and information about temperature development can also be sent by email or text message.

So the person responsible on the site, say the foreman for example, can reliably gauge formwork stripping times, including follow-up treatment times, and judge the earliest possible time for phased pre-stressing the concrete. Temperature development measurements are fundamental for monitoring thermal stresses in the concrete that develop as a result of temperature variances. This awareness helps to put into place avoidance actions mitigating development of thermal cracks and the potential for future structural damage.

***Muskrat Falls – largest Concremote site in the world***

Concrete crack prevention was a prime criterion for forming the Muskrat Falls project in Labrador, Canada. Because extreme weather conditions were a major challenge during construction of the 824 MW hydropower plant designed to supply electricity to the Canadian provinces of Labrador and Newfoundland. Construction and concreting on this project had to continue even when temperatures plummeted to -40 Celsius in winter and rose to +30 Celsius in summer. Heating had to be incorporated into enclosures and formwork systems. With hundreds of measurements, Concremote delivered reliable and real time on-site temperature monitoring and fundamentally contributed in securing the quality of the mass concrete structures. A total of 35 Concremote sensors were in use, making this mega-project also the world's biggest Concremote site to date.

***Highpoint – 47 days ahead of schedule because of Concremote***

The Highpoint residential tower in London aptly illustrates how Concremote helps shorten construction time. All in all, 2350m3 of concrete were poured for the 155 meter high service core, which when finished will provide 457 apartments. Concremote enabled the cycle times for construction of the building core to be shortened by a considerable margin. A full working day was typically saved on each floor cycle, a saving of 47 construction days in all. The data was collected by 4 Concremote sensors incorporated into Doka SCP climbing and formwork systems.

**About Doka:**

Doka is a world leader in developing, manufacturing and distributing formwork technology for use in all fields of the construction sector. With more than 160 sales and logistics facilities in over 70 countries, the Doka Group has a high-performing distribution network which ensures that equipment and technical support are provided swiftly and professionally. An enterprise forming part of the Umdasch Group, the Doka Group employs a worldwide workforce of more than 6,000.

**Photos**

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| K:\Public_Relations_and_Communications\Media_Relations\Medienarbeit\2016\Presseinformationen\2016-11_ConcremoteDigitalisierung\Fotos\klein\Xlife1-CMYK-300PPI-Neu.tif | A Concremote cable sensor installed directly into the wall formwork Framax Xlife.    Doka\_201611\_Concremote\_02.jpg  Photo: Doka GmbH |
| K:\Public_Relations_and_Communications\Media_Relations\Medienarbeit\2016\Presseinformationen\2016-11_ConcremoteDigitalisierung\Fotos\klein\Doka_2013_04_Concremote_IMG_02.jpg | Once the concrete has been screeded, Concremote slab sensors are placed and start measuring automatically.  Doka\_201611\_Concremote\_03.jpg  Photo: Doka GmbH |
| K:\Public_Relations_and_Communications\Media_Relations\Medienarbeit\2016\Presseinformationen\2016-11_ConcremoteDigitalisierung\Fotos\klein\Doka_2015-10-Muskrat_Falls_02.jpg | At Muskrat Falls a total of 35 Concremote sensors were in use, making this mega-project also the world's biggest Concremote site to date.  Doka\_201611\_Concremote\_04.jpg  Photo: Doka GmbH |

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