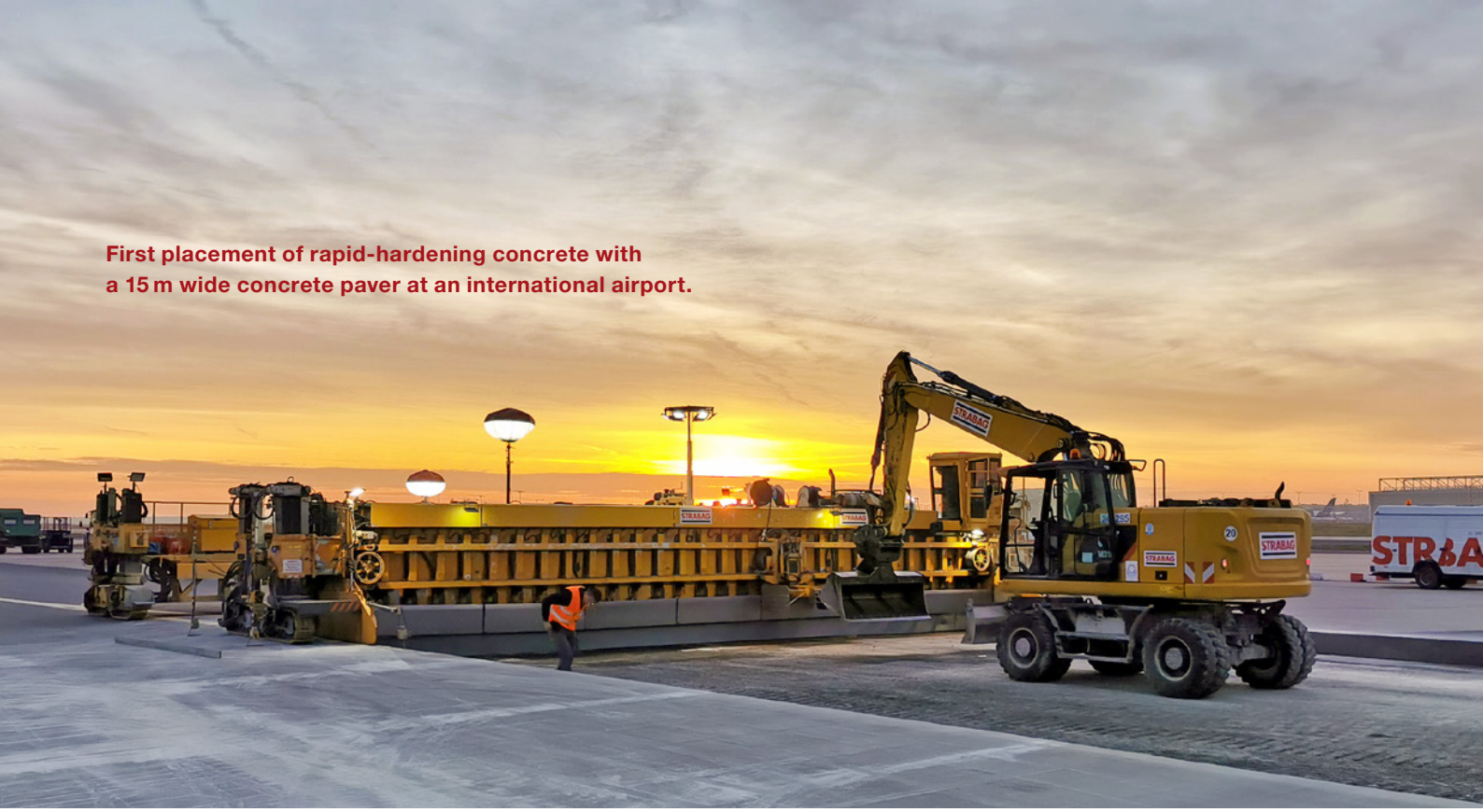
Project Report

Reconstruction with Rapid-Hardening Concrete
Concretum® Q-FLASH 2/20

Frankfurt Airport FRA

- Taxiways
- Stands
- Apron



First placement of rapid-hardening concrete with a 15 m wide concrete paver at an international airport.

Project Overview

A former asphalt taxiway on Frankfurt Airport was rehabilitated in a hybrid construction method. This method consists of a 10 cm thick asphalt base layer, which is covered with 40 cm of concrete. On this site, a 15 m wide and 50 m long lane of rapid-hardening concrete was poured with the help of a concrete paver at once. It was demonstrated that large airfield renewals are possible within short time frames allowing for the minimal possible interruption to aircraft operation.

Project film

OUTPUT CAPACITY AND QUALITY CONTROL

The diagram in Figure 1 displays the hourly output. Initially, production had a slower pace, requiring minor adjustments and changes to the settings of both the concrete plant and the paver. However, with these initial adjustments made, a consistent production rate of approximately 175 m³ of rapid-hardening concrete per hour was achieved. This steady production rate ensured smooth operation of the paver, resulting in optimal quality of the concrete surfaces.

The quality of the concrete was controlled in a two-stage process. In a first step, the strength development was determined by measuring compressive strength on concrete samples. Since time is always limited when replacing slabs at airports and the equipment for testing concrete samples is usually not available on-site, this testing cannot be carried out. For this reason, the temperature development in the concrete is measured. Based on this data, setting of the concrete can be determined.

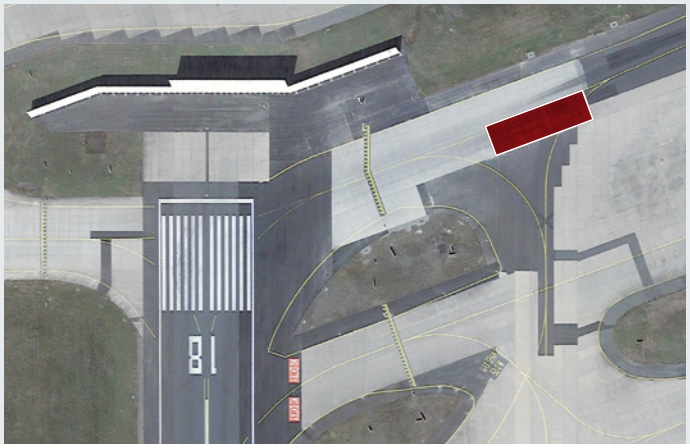
Feeding of the concrete paver with Concretum® Q-FLASH 2/20

Curing of the finished concrete slabs while aircrafts are operating

Metric to imperial system – unit conversion | 1 cm = 0.39 in | 1 m = 3.28 ft | 1 m² = 10.76 ft² | 1 m³ = 1.31 yd³ | 20 °C = 68 °F | 1 N/mm² = 1 MPa = 145.04 psi

Rapid-hardening concrete trial track:

50 m	15 m	40 cm	300 m³	2.5 h
Length	Width	Thickness	Concrete volume	Placement time (effective)



Location of the replaced area (holding bay west, runway 18) at Frankfurt Airport

By superimposing the data of the strength development, it is possible to estimate when the strength of the concrete meets the requirements for the hand-over of the air traffic surface.

In Figure 2, one graph represents the temperature development over time from the production stage (red colored graph), while the other graph illustrates the increase in compressive strength (green colored graph) from the beginning of the setting process. The two graphs share a common reference point, which corresponds to the start of the setting process. This point indicates the end of workability and marks the beginning of strength development in the concrete.

CONCRETE SPECIFICATIONS

Product	Concretum® Q-FLASH 2/20
Exposure class	XC4, XD3, XF4
Strength class	C50/60
Consistency class	zero slump (paver)
Max. aggregate size	22 mm, crushed

CONCRETE PROPERTIES

Open time	1.5–2 hours
Fresh concrete temperature	13–17 °C
Compressive strength 1 h after setting	25 N/mm²
Compressive strength 2 h after setting	29 N/mm²
Compressive strength at 28 days	75 N/mm²

Figure 1: Effective production output of rapid-hardening concrete

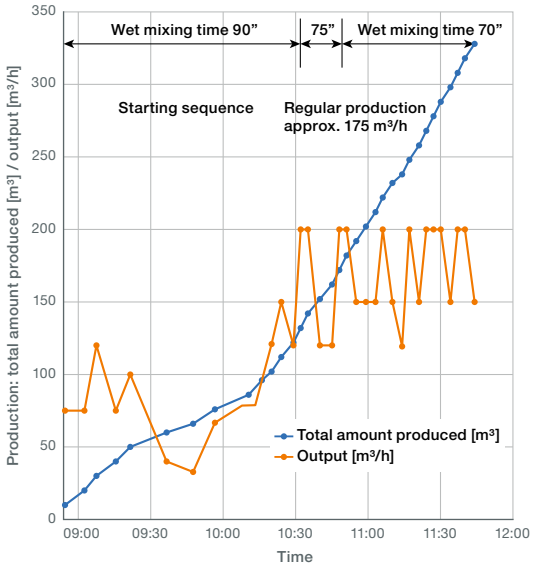
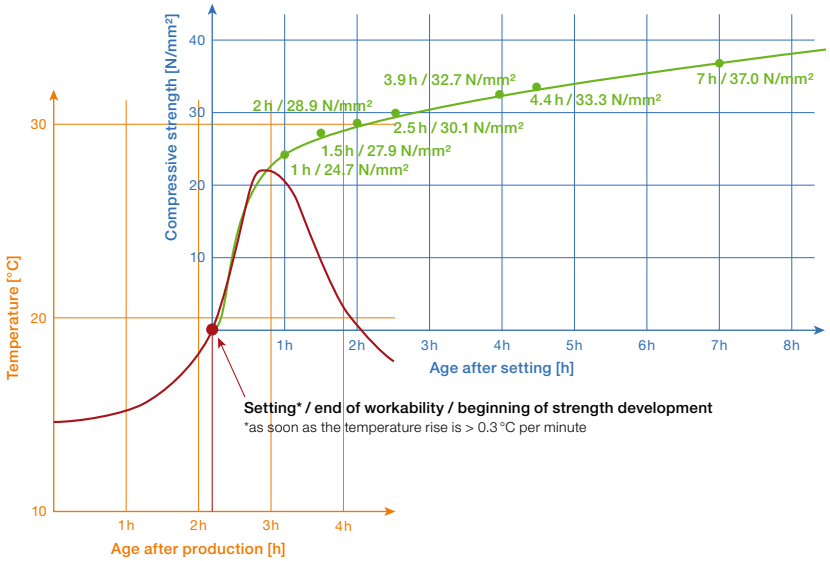


Figure 2: Superimposing temperature and strength for Concretum® Q-FLASH 2/20, a rapid-hardening concrete



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