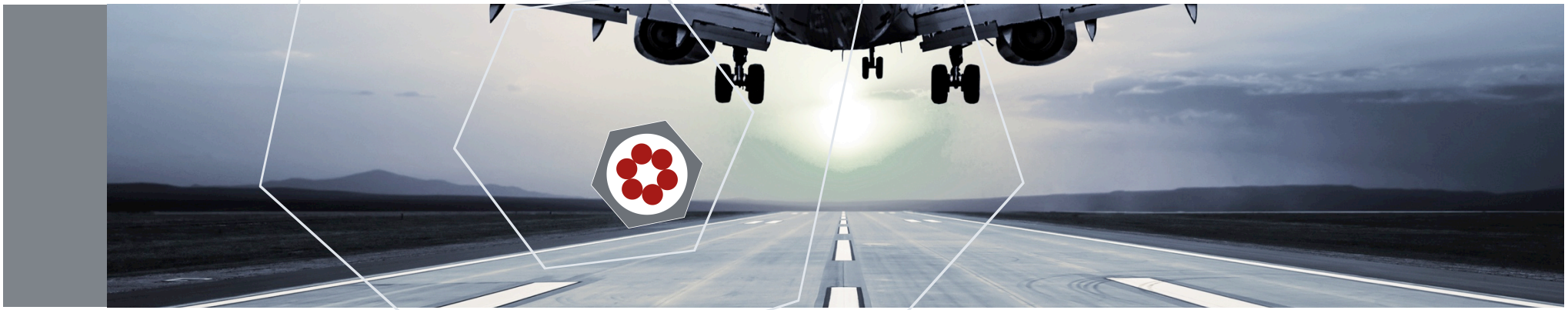
concretum
the fastest concrete



Airport pavement renewals using rapid-hardening concrete

material technology and examples from the practice

Jakob Melchior, Senior Project Engineer Concretum AG, 21.2.2020

concretum

- Supplier of high-tech concretes and technical project assistance
- Based in Zürich, Switzerland
- 12 employees with its own R&D and quality-control laboratory
- Specialized in over-night renewals at airports
- Concretum Q-FLASH 2/20 rapid-hardening concrete
- Worldwide market with a European focus

concretum
the fastest concrete

Runway Renovation

Sabiha Gökçen Airport
Istanbul

2018

Havaalanı İşletme ve Havacılık Endüstrileri A.Ş.

concretum
the fastest concrete

concretum
the fastest concrete

Airport pavement renewals – why? – constraints?

- ☑ Ageing airport pavements develop damages (FOD, dangerous landings, etc.)
- ☑ No time for maintenance due to tight operations schedules
- ☑ Cost effective long-term solution required

concretum
the fastest concrete

Airport pavement renewals – how?

- Over-night renewals during nightly closures
- Step-by-step renewals over multiple nights
- Only replacing the damaged areas
- High durability concrete

⟹ **Only possible using rapid-hardening concrete**

concretum
the fastest concrete

Technologies of rapid-hardening cements

Alternative underlying technologies

- Ordinary Portland Cement (OPC) with accelerators
- Calcium Sulfo Aluminate Cement (CSA)
- Compounds (like Concretum Q-FLASH 2/20)

Different performance features depending on underlying technology

- Strength development
- Durability
- Large scale applicability
- Costs

concretum
the fastest concrete

Technologies (rapid-hardening cements)

Performance

fresh concrete properties

- **open-time**
- **workability**

→ **placement method, quality of surface & quantity per night**

hardened concrete properties

- **early-age strength development**
- **long term durability**

→ **impact on operations, quantity per night & long-term costs**

concretum
the fastest concrete

Q-FLASH 2/20 rapid-hardening concrete

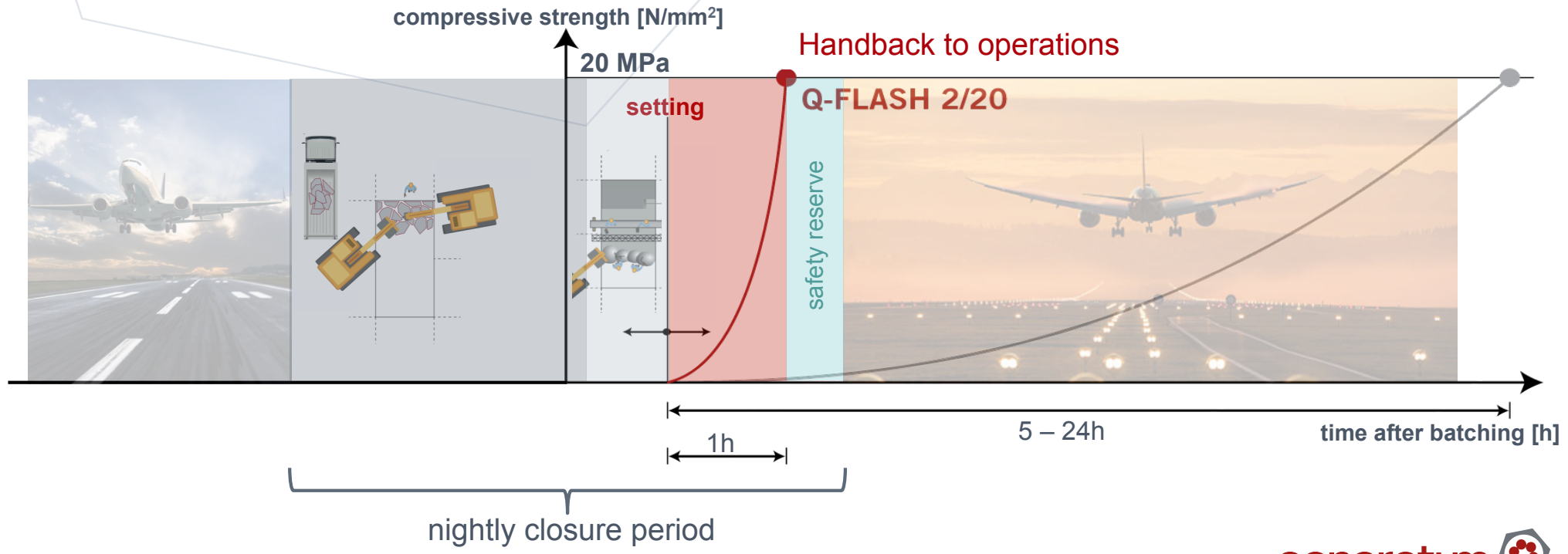
- Q-FLASH cem100: Fully mineral compound with mainly OPC and CSA → **fast strength development & high durability**
- Q-FLASH sp: synthetic polymer superplasticizer → **desired workability**
- Q-FLASH ret: acid based retarder → **desired open-time**

Q-FLASH cem 100 (P)

Q-FLASH ret (L)
Q-FLASH sp (L)

concretum
the fastest concrete

Importance of rapid strength development



concretum
the fastest concrete

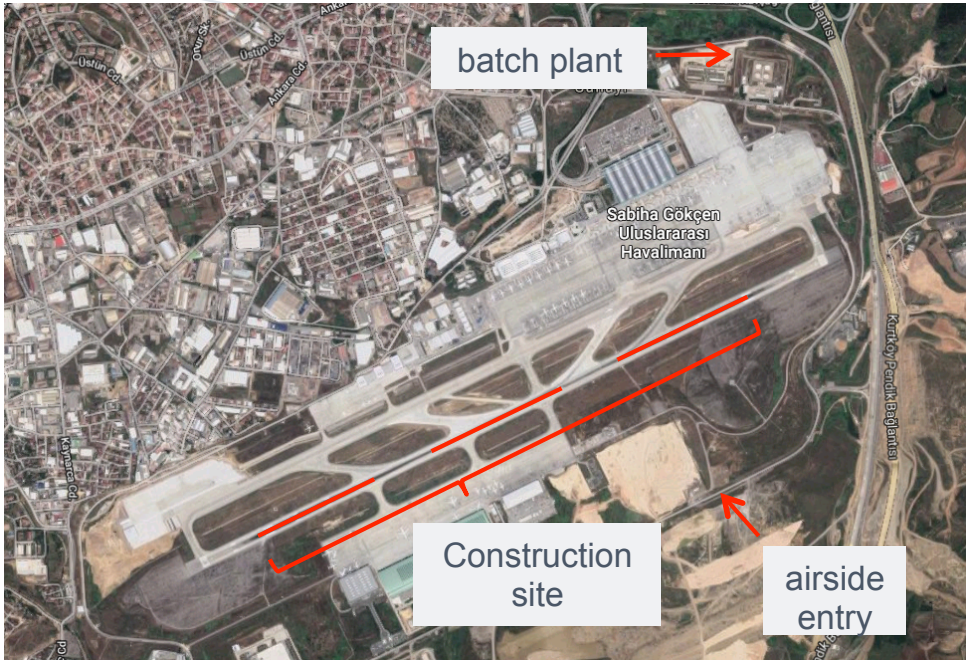
Projects - Sabiha Gökçen Airport Istanbul

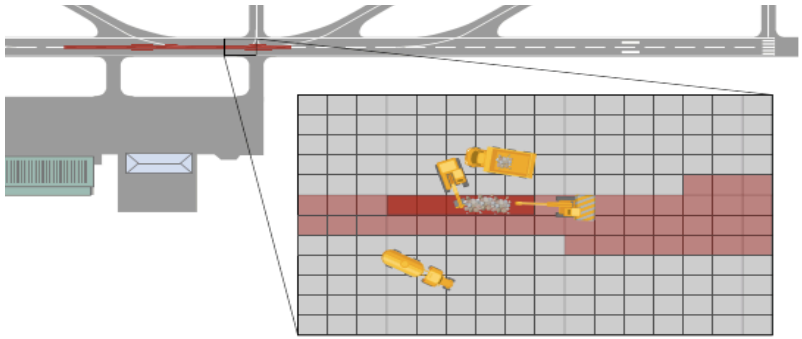
Single runway in urgent need of renewal

concretum
the fastest concrete

Projects - Sabiha Gökçen Airport Istanbul

Concrete production & site logistics

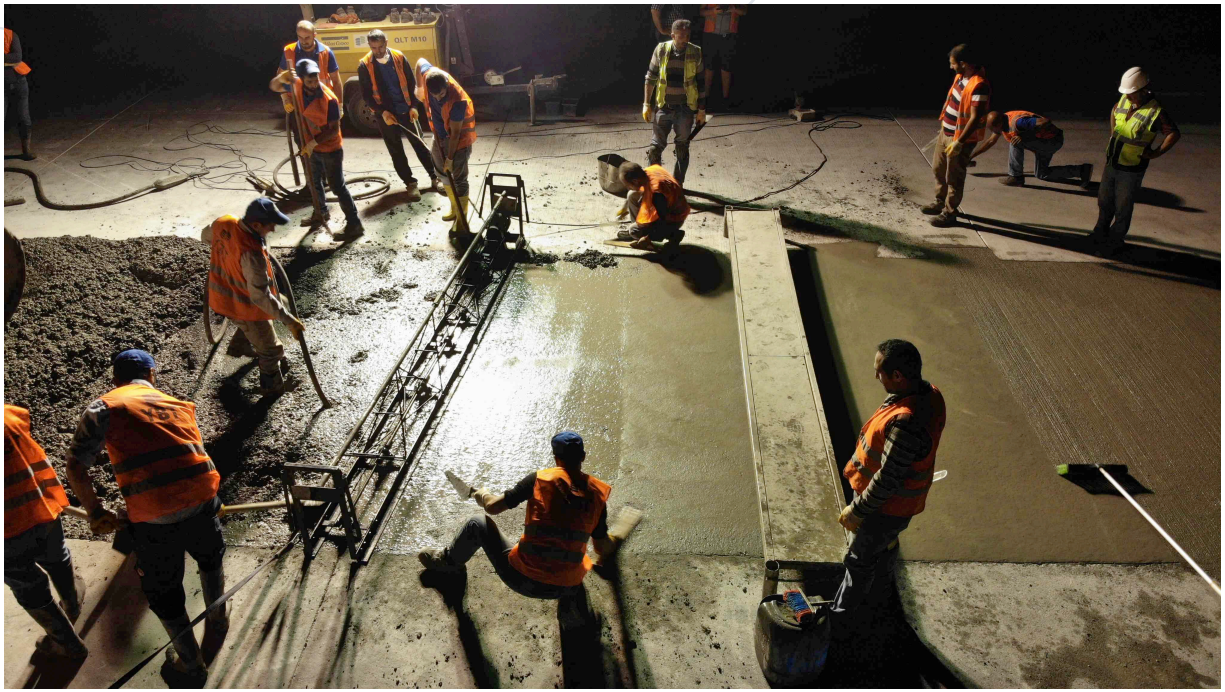




concretum
the fastest concrete

Projects - Sabiha Gökçen Airport Istanbul

Concrete placement



concretum
the fastest concrete

Projects - Sabiha Gökçen Airport Istanbul

Concrete properties

- ☑ Mixing of concrete with local aggregates (0-38 mm crushed limestone) and Concretum's cement and admixtures in local concrete batching plant
- ☑ Cement dosage of 380 kg/m^3
- ☑ Open-time of 60-70 minutes independent of fresh-concrete temperature
- ☑ Slump of around 80 mm equal to the regular concrete in Turkey
- ☑ Compressive strength of > 20 MPa just 60 minutes after setting

concretum
the fastest concrete

Projects - Sabiha Gökçen Airport Istanbul

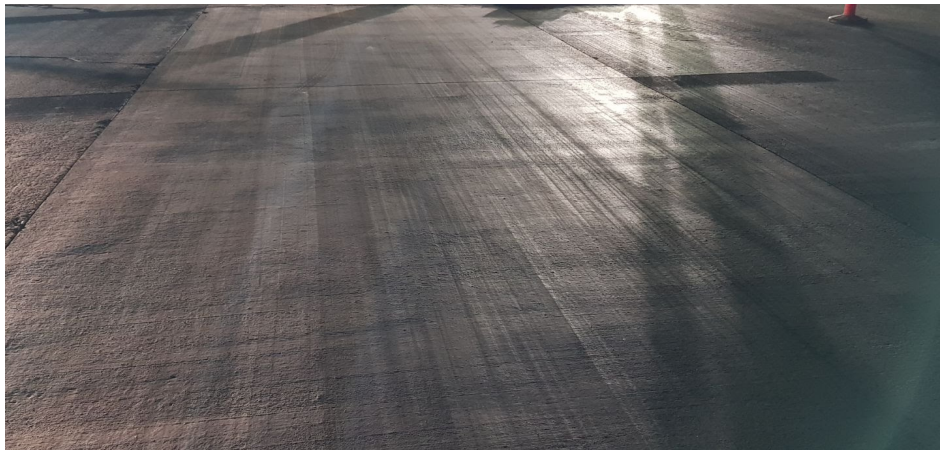
- ➢ Concrete slabs renewed on Istanbul Sabiha Gökçen Aiport‘s single runway during 5-hour-nightly closures (1 am to 6 am)
- ☑ 2018: 465 slabs / 8‘200 m^2 in 117 nights (70 m^2/night on average)
- ☑ 2019: 387 slabs / 7260 m^2 in 78 nights (93 m^2/night on average)
- ☑ A maximum of 7 slabs / 131 m^2 / 66 m^3 concrete was placed during a single 5-hour night
- ☑ Only 8 canceled nights (delayed operations or weather)

concretum
the fastest concrete

Projects - Sabiha Gökçen Airport Istanbul

BEFORE

AFTER



concretum
the fastest concrete

Projects - Paris Charles de Gaulle Airport

Asphalt patches within concrete pavement

concretum
the fastest concrete

Projects - Paris Charles de Gaulle Airport

Concrete production & site logistics

concretum
the fastest concrete

Projects - Paris Charles de Gaulle Airport

Concrete placement

concretum
the fastest concrete

Projects - Paris Charles de Gaulle Airport

Concrete properties

- ☑ Mixing of concrete with local aggregates (0-22 mm crushed limestone) and Concretum's cement and admixtures on-site using mobile batching trucks
- ☑ Cement dosage of 420 kg/m^3
- ☑ Open-time of 20-30 minutes independent of fresh-concrete temperature
- ☑ Slump of around 100 mm equal to the regular concrete in France
- ☑ Compressive strength of > 20 MPa just 60 minutes after setting

concretum
the fastest concrete

Projects - Paris Charles de Gaulle Airport

- Individual 7.5m x 7.5m concrete slabs renewed airsite at Paris Charles de Gaulle during short 4-hour closures

- ☑ 2017: 870 m^2 / 15 slabs
- ☑ 2018: 1890 m^2 / 34 slabs
- ☑ 2019: 3900 m^2 / 70 slabs

Projects - Zürich Airport

Demonstration using a slipform paver

concretum
the fastest concrete

Thank you for the attention

Questions?

"Looks like a classic case of too much concrete."

concretum
the fastest concrete