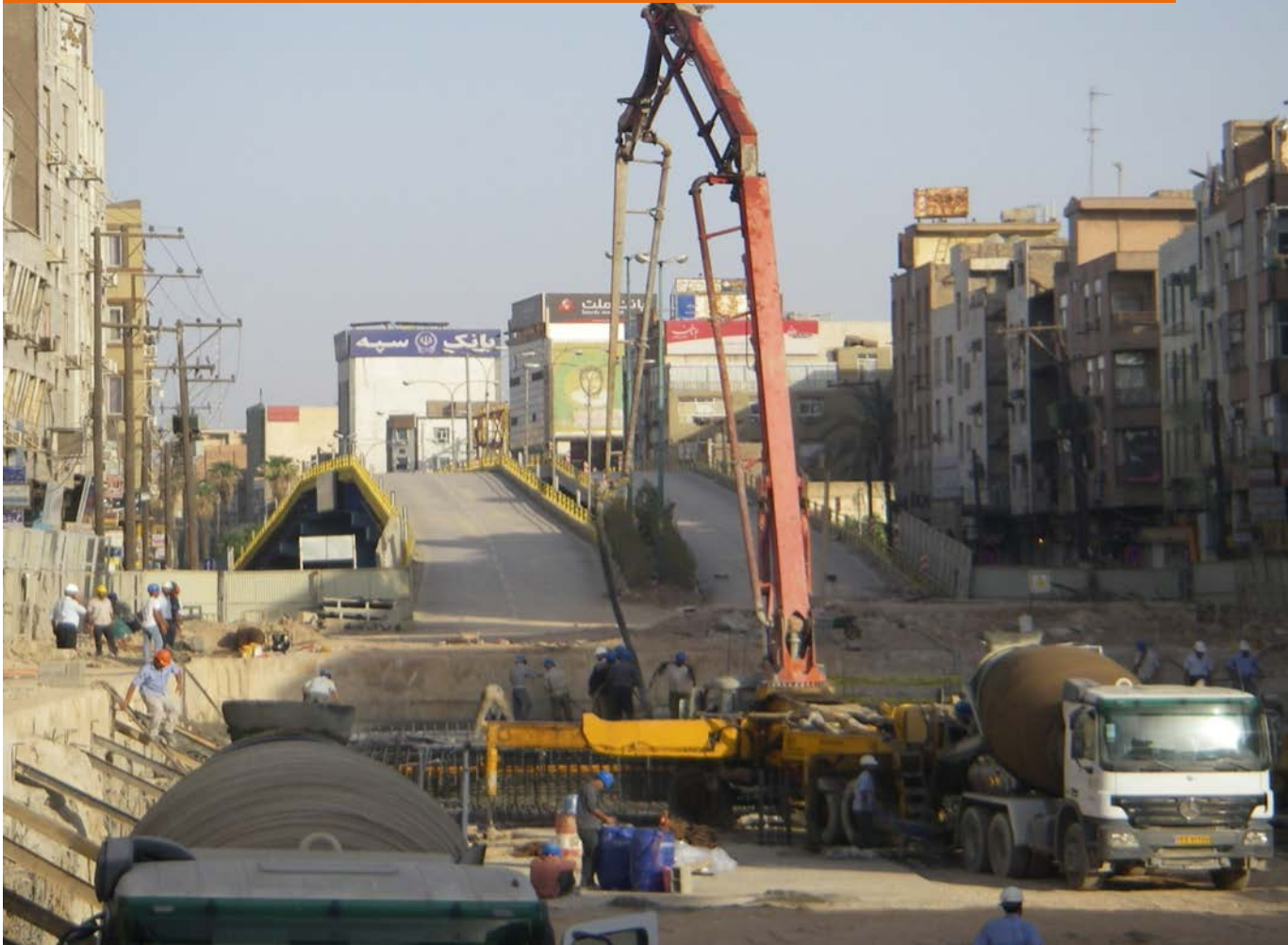


AHWAZ METRO



Ahwaz Metro Project, Iran

Metro Tunnels for Urban Railway Network in Ahwaz.

Scope

- Two metro tunnels
- Single-track
- 23 km each
- EPB TBMs
- Diameter 6.50 m
- 23 Stations by cut-and-cover

Challenges

- Urban area
- Mixed face conditions
- High ground water levels
- Cohesive and non-cohesive sands
- Under passing Karoon River and various oil pipelines

Amberg Services

- Design and reviews
- Alignment optimizations
- Settlement, face pressure calculations & analysis
- Risk- and quality management
- Cross passage design
- Design of adequate contingency measures for problematic ground conditions



■ Kayson Metro Project



■ Bridge crossing Karoon River



■ Start shaft for TBM's

AMBERG FACTS

Contracted value Amberg

- Total 1.7 Mio. €

Project Phases

- Design phase since 2010
- Realization since 2010

Project Details

Metro Tunnels

- Two metro tunnels
- Single-track
- 23 km each tunnel
- EPB-TBMs
- Diameter 6.50 m

Metro Stations

- 23 Stations by cut and cover

CLIENT FACTS

Total value

- Total 650 Mio. €

Scope

- Metro Tunnel for Urban Railway Network
- Length 2 x 23 km
- 23 metro stations

Geology

- Sedimentary rocks, cohesive and non-cohesive soils
- Mixed-face conditions, high ground-water level
- Overburden 10 – 27 m
- Earthquake area

CHALLENGES

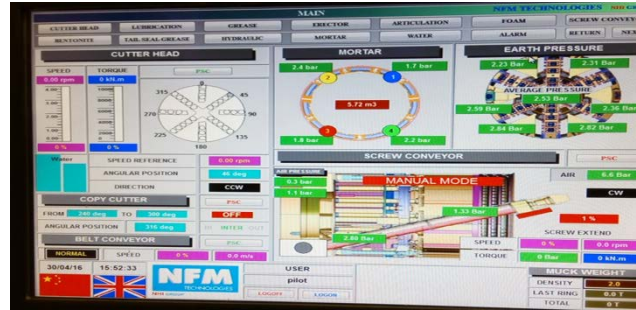


Situation under passing Karoon River

Under passing the Karun River

- Difficult / limited site investigation in the river available
- High face support pressure required
- Difficult ground conditions
- Most critical part of alignment
- Difficult conditions on site, compared to other sections

ENGINEERING APPROACH



Optimized TBM driving

Optimized TBM heading

- Optimization of the alignment to reduce tunnelling risks
- Detailed site investigation, then horizontal and vertical alignment modification to avoid / reduce identified problems.
- Detailed face pressure design calculations
- Monitoring of TBM parameters, as such that the applied face pressure follows design calculations

TECHNICAL SOLUTIONS



Completed construction of tunnel

Quality control and expertise on site

- On site Amberg expert consulting for preparation
- On site Amberg expert during the phase of under passing of the river
- On site services during execution
- Identification of problems and proposal of solutions to the client