UMA OYA – MULTIPURPOSE DEVELOPMENT

Hydropower and Irrigation Plan, Province Uya, Sri Lanka

The Uma Oya Multipurpose Development Project is a water transfer, hydropower and irrigation project in the south-eastern part of the central high-land region of Sri Lanka. The main part of the scheme is situated in the south-western part of the Badulla district in the province of Uya.

Scope

- Transfer annual water quantity of 145 million m3 for irrigation purpose
- Production of electricity in a power plant, rated capacity of 120 MW
- Puhulpola dam reservoir will be conveyed through a 3.9 km long tunnel into the reservoir of Dyraaba dam built on Mahatotilla Oya River
- From there by means of a 15.3 km long headrace tunnel and a 628 m high vertical shaft, water will be conveyed to the underground powerhouse

Challenges

- Infrastructure at countryside
- Geological conditions

Amberg Services

- Alignment optimization
- Examination of geology and geotechnical studies
- Design
- Site supervision
- Client consultancy

AMBERG ENGINEERING

- Landscape with installation site

- Installation site with segment factory

- Set up of hard rock TBM

AMBERG FACTS

Amberg contracted value

- Total 3.0 Mio. CHF

Project Phases & Duration

- Detailed design since 2013
- Construction drawings since 2013
- Site supervision 2013 – 2017

Project Details

Amberg Engineering Awards

- Consulting services for examination of geology and geotechnical studies, optimization and final selection of tunnel alignment
- Review of TBM specifications
- Detail design studies and preparation of construction drawings for the upstream part of the Headrace tunnel and the conveyance tunnel
- Related intake and outlet structures, adit tunnels, portal excavations

CLIENT FACTS

Overall costs

- Total 480 Mio. CHF

Overview Project

Headrace tunnel

- Length 15.3 km
- Diameter 4.3 m

Conveyance tunnel

- Length 3.9 km
- Diameter 4.1 m

Other Details

- Intake and outlet structures
- 2 TBM adit tunnels

Geology

- The project is located in Precambrian crystalline metamorphic rocks of the Highland Complex of Sri Lanka
- The formation comprises gently folded amphibolite and charnokite gneisses, quartzite and marbles

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CHALLENGES

Water ingress at TBM cutter head

Water ingress into Tunnel

- Fracture zones with instable rock sections
- Unexpected high water ingress into tunnel during excavation

ENGINEERING APPROACH

High pressure cement injections for grouting

Design for grouting works

- Investigation of water bearing zones ahead of the tunnel face using Tunnel Seismic Prediction (TSP)
- Special rock mass grouting design in order to stop / reduce water flow to the tunnel
- Execution of a drilling program for grouting works
- Adaptation of grout design during execution, depending on executed grouting works
- Quality control during grouting process

TECHNICAL SOLUTIONS

Tunnel after grouting, water ingress was stopped

Extensive rock mass grouting

- Huge amounts of grouting cement have been injected over length of the tunnel
- Detailed supervision and interpretation of grouting works during execution
- Water ingress in this tunnel section has been reduced significantly
- The groundwater level recovered
- Finally a tunnel is obtained with largely reduced water ingress

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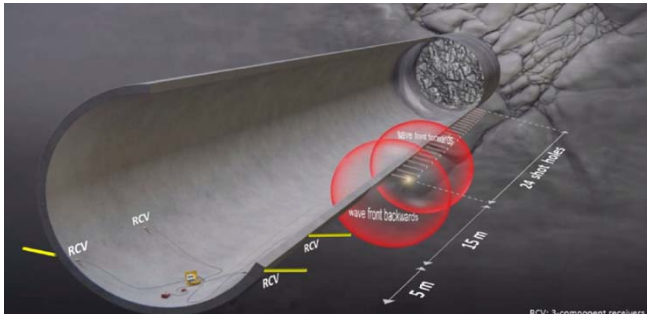
CHALLENGES

- Heavy water ingress

- High pressure water ingress

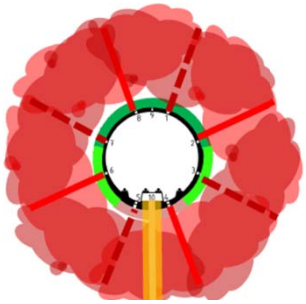
- Water ingress at segment joints

ENGINEERING APPROACH



- Seismic investigations of water bearing zones

- Drilling in invert for rock mass grouting works



- Grouting design with overlapping injections

TECHNICAL SOLUTIONS

- Documentation of grouting work

- Grouting monitoring

- Completed tunnel, water bearing zones sealed

AMBERG ENGINEERING

AMBERG KEY PEOPLE INVOLVED

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AMBERG TEAM @ WORK