Gleinalmtunnel
Neubau der zweiten Röhre
Logistische Herausforderungen

Gleinalm Motorway Tunnel
2nd tube
Logistical challenges
overview:

A9 – Section:
St. Michael – Peggau

Traffic:
2013: 22,500 vehicles / day
2019: 24,000 vehicles / day

Safety:
Tunnel Safety Law: 30.4.2019

Costs:
Construction 2nd tube: € 159 Mio
Refurbishment 1st tube: € 76 Mio
1971: Start of planning / exploration
1973: Pilot tunnel (8m²) and 2 shafts (~ 300m)
1974: Start of lot south and lot north
1978: Opening ceremony
Project data – 1974 and 2013

1974:
- 8.1 km tunnel ... drill & blast (2 Lots)
- 3 cross passages
- 2 shafts (230m – 366m)
- 2 ventilation caverns
- 2 portal galeries & buildlings
- 4 years construction time

2013:
- 8.1 km tunnel ... drill & blast
- 34 cross passages
- 15 ventilation / emergency bays
- 2 ventilation caverns & connection
- 2 new portal galeries (50%)
- 4 years construction time
Project layout – 1974 and 2013

north portal area

2nd tube

1st tube

south portal area
Cross section

OSTRÖHRE
2nd TUBE

WESTRÖHRE
1st TUBE

QUERSCHLAG
CROSS PASSAGE

NORD
NORTH

SÜD
SOUTH
Tendering – Offer & Contract:

tender design:
- **NATM / Drill & blast (top heading / bench&invert)**
- full face excavation possible – limited field of tenderers possible
- TBM (clearance due to existing portal buildings)

Offers (6 offers + 1 alternative):
- Group ÖSTU-Stettin – Gebrüder Hinteregger & Söhne – Wayss&Freytag Ingenieurbau GmbH
Tendering – Offer & Contract:

alternative offer „Excavation“:
- considerations based on knowledge of 1st tube
- full-face excavation
- new full face excavation classes & design provided by tenderer
- transfer of risk for quantity of excavation classes - common rules for alternatives

Intense Tender evaluation: „robust & economic“ - commissioned!
Highlights of excavation works:

- Favorable rock mass conditions - „horizontal quarry“
- Main tasks: Drill & blast – mucking
- Only limited support installation

- Top heading / bench & invert in portal areas
- Full face excavation for approx. 85% of tunnel drive
- Total excavation time: 760 days
Top heading / Bench & Invert

- Excavation Profile: 55m² / 30m²
- Round length: 2,20m / 4,00m
- Shotcrete: 15 cm / 5 cm
- Wire mesh: 1 layer / -
- 8 / 4 self expanding friction bolts

- Advance: 10m / 30m per day
- 1974: 7,35 – 15,0 m per day
Full Face Excavation

- Excavation Profile: 85 m²
- Round length: 3.50 m
- fibre shotcrete: 10 cm / 5 cm
- 5 - 6 self expanding friction bolts

- Advance: 12.0 - 17.5 m per day / drive
- 1974: 15.6 – 24.0 m per day
Drill & Blast - Logistics:

- most time consuming work
- emulsion explosives
- non electric detonators
- automatic drilling pattern jumbo with 3 arms
- partly „dual delay system“
Drill & Blast:

- 750 - 1,000 kg / round length
- 2.57 kg/m³
- 2 x 5 rounds per day
- 5,000 kg explosives per day
- 1,900 tons explosives total

- 1974: 1,10 kg/m³ (full face into pilot tunnel)
Drill & Blast - Limitations:

Ventilation:
- Additional measures after approx. 3 km drive

Mucking:
- temp. disposal area near the face
Cross Passages:

- 8 cross passages, open to emergency traffic
- 25 cross passages for pedestrians
- Break through within one night shift
Ventilation Cavern:

- excavation of regular profile
- widening:
  - top heading
  - bench 1
  - bench 2
  - invert
Inner Lining & Potal Galeries

Inner Lining – 392 days

- 25 cm concrete
- Partly reinforced
- 2 formworks
- several special formworks
- 4 tables for vent. ceiling
- 127,000m³ + 20,000m³
Inner Lining & Portal Galeries

Portal Galleries – 365 days:

- architectural design competition
- Reinforced concrete structure
- Funnel shaped opening
- 5,000 m³ concrete
- 600 tons reinforcement
Video

Inner Lining and Portal Galeries
GÖSTEIN
STETTIN

G. HINTEREGGER
Baugesellschaft m.b.H.

W&F
Ingenieurbau

GLEINALMTUNNEL
NEUBAU 2. RÖHRE

Stand: August/2015
Conclusions and Preview:

- "mission accomplished", construction works finished in 09.2016
- Traffic equipment, electrification, tests … 06.2017
- 2nd tube open in 07.2017 (traffic in both directions)
- Refurbishment of 1st tube
- Operation of both tubes … 04.2019