

MAPEI UTT – TBM project reference

“Santa Lucia” tunnel in Barberino di Mugello, Italy

Project: highway A1 Milan-Naples

Client	Autostrade per l'Italia S.p.A.
Construction supervisor	SPEA Engineering S.p.A.
Contractor	Pavimental S.p.A.



Image 1. 15.96m TBM diameter: the largest TBM ever used in Europe and one of the largest in the world.

Tunnel and TBM data

<i>TBM type</i>	Earth Pressure Balance (EPB)
<i>TBM diameter</i>	15.96m
<i>Tunnel length</i>	7.55km
<i>Segments:</i>	
- <i>Length</i>	2.2m
- <i>Thickness</i>	55 cm
- <i>Weight</i>	16 tons

MAPEI UTT products for the project

Foaming agent for soil conditioning

Anti-foaming agent

*Admixture for two-components back-filling
grout*

Products for precast segment production

Waterproofing membrane

POLYFOAMER ECO/100

DEFOAMER XP/BIO 1

MAPEQUICK CBS SYSTEM 1L

MAPEQUICK CBS SYSTEM 3

DYNAMON NRG 1015 S

MAPEFORM 1500

MAPEPLAN TU 20



Images 2 and 3. Segment production with Dynamon NRG1015S and one of the niches waterproofed with Mapeplan TU20.



Image 4. Polyfoamer ECO/100 is delivered in bulk and stored on site in MAPEI tanks.

Soil conditioning with **POLYFOAMER ECO/100**

POLYFOAMER ECO/100 = foaming agent with minimum environmental impact for sustainable soil conditioning.

Technical aspects

- Long half-life
- Compatible to all types of soil
- Lubrication effect thanks to the presence of the polymer

Environmental aspects

- Innovative formulation compared to traditional foaming agents
 - Faster biodegradability
 - Lower toxicity
 - Less organic added to the muck

POLYFOAMER ECO/100 has been selected for the “Santa Lucia” tunnel after:

- Technical tests carried out at the University “Politecnico di Torino”
- Environmental tests carried out at “CNR” = National Research Council

Geology

- “Monte Morello”: limestone and marlstone
- “Sillano”: clay, claystone and limestone. Cohesive material with stickiness effect

Working mode

Full EPB chamber with pressure up to 2.5 bar



Images 5 and 6. Samples of “Monte Morello” and “Sillano” soils conditioned with Polyfoamer ECO/100.

<i>TBM Parameter</i>	<i>Average values</i>
<i>Advance speed</i>	20 – 30 mm/min
<i>Cutter head torque</i>	20 – 25 MN*m at 1.5 rpm (40-45%)
<i>Thrust force</i>	70 – 80 MN
<i>EPB pressure at the face</i>	Up to 2.5 bar in the crown
<i>Consumption of POLYFOAMER ECO/100</i>	500 – 700 l/advance (1.0 – 1.5 l/m ³ of soil excavated)



Image 7. TBM excavation through the “Sillano” geological formation.



Image 9. Final break-through of the TBM

Underground Technology Team

Mapei S.p.A.