

## Geosynthetics in Slovak Republic – Case history

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### 1 INTRODUCTION

In the territory of the former Czechoslovakia textile industry has a long, successful and pioneering history. In the middle of the eighties, experiments have been carried out to apply the existing products – technical textiles – in civil engineering. In highway engineering the separation effect of woven textiles (nowadays woven geotextiles) has been verified in the construction of temporary access road. In hydraulic engineering the filtration effect of needle-punched textiles (nowadays-nonwoven geotextiles) has been verified beneath the revetment structures onto riverbanks and in draining trenches.

The first large application of geotextile in Czechoslovakia was realized in the Prague – Bratislava highway in 1977. There was a 400 000 m<sup>2</sup> nonwoven geotextile put on the base of the highway embankment with a height of 10 m on a soft foundation in the inundation area of the river Morava.

### 2 OVERVIEW

#### 2.1 *Original geosynthetic products and technologies*

In a Research Institute for Man-Made Fibres, Svit in 1977 a technology procedure of a 100 % polypropylene nonwoven needle punched geotextile produced directly under the spinning nozzle was developed (Hruz 1984). Tatralan Company produced geotextiles named Tatrutex of mass per unit area from 300 to 600 g/m<sup>2</sup>. Nonwoven geotextiles with a mass per unit area from 200 to 1500 g/m<sup>2</sup> are still produced by this original technology.

Another Slovak geosynthetic product Tatrabent – GCL was developed in the nineties. This geocomposite contains of nonwoven geotextiles Tatrutex and a bentonite-zeolite filler (Baslik et al. 1994). The original part of this GCL is its filler, which is a combination of a high quality bentonite and zeolite from the Slovak Republic. The bentonite has a sealing and

the zeolite a sorption effect. This means that the GCL Tatrabent is not only a sealing element but also an extremely high efficient sorbent of metals. GCL is an effective environmental sealing product. A detail research of the effect of the GCL has been carried out in the Slovak Academy of Sciences Bratislava (Janotka et al. 1999).

In the eighties a geodrain named PSK drain was developed with the co-operation of Dopravni stavby Olomouc and VUIS Bratislava (Petrik et al., 1987). Except the geodrain and the installation equipment a design method was also developed. The first installation of geodrain in the Slovak Republic was realised in the construction of a railway embankment in Nuclear Power Station Mochovce area in 1987.

#### 2.2 *Research and development*

Geosynthetics research in Slovakia, part of the former Czechoslovakia, was carried out in accordance with the international trend especially in the Civil Engineering Research Institute (VUIS) in Bratislava. Results of the research were presented already in the first geosynthetic conference in Paris (Petrik 1977). Brochures published by VUIS contains research results in the following areas:

- development of techniques for soil improvement and foundation engineering, geotechnical engineering (e.g. Petrik 1978)
- pavement systems (e.g. Lovecek et al. 1974)
- hydraulic engineering (Bartusek, J. 1982)
- environmental engineering, landfills.

The Slovak technical standards (STN 73 3040 and STN 73 3041) were prepared on the base of research results.

Current research are carried out mainly in the following centres:

- Department of Engineering Geology, Faculty of Natural Sciences, Comenius University, Bratislava

Table 1. A list of typical geosynthetics application in Slovakia

Project	Geosynthetics	Project description
Highway D18, Bratislava - Zilina	GTXn, GTXw, GG, GCd, GM	Reinforced soil structures (retaining walls, steep slopes, bridge wings, embankments on soft subsoil, subbase layers)
Rail network modernisation, Bratislava - Zilina - Zwardon, Bratislava - Kuty	GTXn, GTXw, GG, GCd, GCL	Reinforced track substructure (subbase on soft subgrade), widening of embankment on soft subsoil
Water power work, canal 16.3 km Gabčíkovo	GTXn, GM	Lining systems
Water power work, canal, Zilina	GTXn, GM	Geosynthetic lining system in canal
Landfills, 20 localities, (e.g. Handlova, Zohor)	GTXn, GM, GCL, GCd	Geosynthetics lining systems
Business centres, industry parks, shopping centres, store halls, etc.	GTXn; GTXw, GG, GC	Separation layers, reinforced subbase layers under foundations and floors

GTXn – nonwoven geotextile, GTXw – woven geotextile, GG – geogrid, GM – geomembrane, GCd – drainage geocomposite, GCL – geocomposite clay liner,

- Faculty of Civil Engineering, University of Zilina
  - Department of Railway Engineering and Track Management
  - Department of Geotechnics
- Slovak Academy of Sciences, Bratislava
- Faculty of Civil Engineering, Slovak Technical University, Bratislava
  - Department of Geotechnics
  - Department of Transportation Engineering

### 3 APPLICATION OF GEOSYNTHETICS

The Slovak Republic is built of Mesozoic to Cainozoic – Quaternary sediments, geographically belongs mainly to mountainous area, tectonically it is highly disturbed and the quaternary sediments are often soft and compressible. For these reasons during the construction of highways, railways, hydraulic, environmental and other structures occurs the necessity to apply all types of geosynthetic products.

In the nineties, after the birth of the Slovak Republic and the change of the economical system, all the prestigious foreign companies came to Slovakia with their geosynthetic products. It can be said, that at present in Slovakia all types of geosynthetic products are used, for all functions, in every type of construction as it is presented in the IGS documents and in the international IGS conferences. Some of the significant constructions of the past, whereby geosynthetic products are applied are presented below (Tab. 1):

### 4 CONCLUSIONS

In Slovak Republic geosynthetics have been used for almost 25 years. Geosynthetics is a very effective tool to solve some special local geotechnical problems.

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