MANAGING ROAD INFRASTRUCTURE AT ASFINAG BY USING GIS

ASFINAG, Peter Aubrecht
Austria, Salzburg, 15th October 2015
European GIS User Conference
The ASFINAG Group
Overview GIS
Objectives
- Asset Management
- Operational Activities
- Road Works and Construction Site Management
- Tolling
Quite new
Summary
The ASFINAG Group

ASFINAG
Autobahnen- und Schnellstraßen-Finanzierungs-Aktiengesellschaft
(Motorway and Expressway Financing plc)

- ASFINAG Bau Management GmbH
- ASFINAG Service GmbH
- ASFINAG Alpenstraßen GmbH
- ASFINAG Maut Service GmbH
- ASFINAG Commercial Services GmbH
- ROADNETWORK planning
- GIS
- ASFINAG European Toll Service GmbH
ASFINAG is an efficiently operating user-financed builder and operator of motorways and expressways.

We provide a road network that meets our customers’ requirements, is well-serviced and developed with a special focus on road safety and optimal availability as well as user-friendly tolling systems.

All our activities are directed towards fulfilling our economic, environmental and social responsibilities whilst strengthening Austria’s position as a business location.
ASFINAG is one of Europe’s leading motorway network operators with a special focus on
    • availability
    • traffic management
    • traffic information
    • road safety and
    • technological innovations

We act internationally and interlink with public transport.
The ASFINAG Group
Construction Program (EUR mil.)

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
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<td>Ist Plan</td>
<td>341</td>
<td>483</td>
<td>801</td>
<td>809</td>
<td>865</td>
<td>802</td>
<td>732</td>
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<tr>
<td>Plan</td>
<td>327</td>
<td>459</td>
<td>52</td>
<td>45</td>
<td>68</td>
<td>81</td>
<td>15</td>
</tr>
</tbody>
</table>

Legend:
- New constructions & expansion
- Structural maintenance
- Investment
The ASFINAG Group

Trans-European Network (TEN), Corridors
The ASFINAG Group
Facilities and Employees
The ASFINAG Group

Toll Revenues
Department Road Network Planning

The Road Network Planning department is responsible for:

- Generating **long – term programs** for predefined road sections
- Establishing Concepts and studies for **mid – term activities**
- Executing **specific projects**, e.g. opening safety lane for traffic
- Coordinating the **construction site program** and short – term construction site activities for the ASFINAG road network
- Supporting ASFINAG with the **Geographic Information System (GIS)**
OVERVIEW GIS
GIS Team

• Supplying a modern, state-of-the-art GIS system architecture

• Geographic Platform with high performance and reliable data

• Cartographic visualisation in a self explanatory and pleasant way

• Interfaces to databases and harmonising data: Integration of several information of different units; avoiding redundancy

• GIS as service provider for all employees and contractors of ASFINAG

• Providing geodata, surveying data, infrastructure objects, condition information, construction site program, planning issues

• Supporting several projects with spatial analysis of geodata
OVERVIEW GIS
The ASFINAG Road Network
### OVERVIEW GIS

The ASFINAG Road Network

<table>
<thead>
<tr>
<th>Number of motorways</th>
<th>19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of expressways</td>
<td>14</td>
</tr>
<tr>
<td>Length</td>
<td>2.183 km</td>
</tr>
<tr>
<td>Total lane length</td>
<td>11.700 km</td>
</tr>
<tr>
<td>Reference</td>
<td>Road name, kilometres, infrastructure objects, Specific sections</td>
</tr>
</tbody>
</table>
ASFINAG road network is part of GIP (Graph Integration Platform)

GIP is a joint project of the Austrian Federal States, ASFINAG, ÖBB Infrastructure, the Austrian Federal Ministry of Transport, Innovation and Technology, ITS Vienna Region, (the Austrian Association of Cities and Towns is an associated partner)

GIP - the basis for a modern administration of Austria’s transport routes

A nationwide transport graph, which will provide a digital map of Austria's transport network available to all authorities

the common “official” reference graph to which all the different systems of the administrative units can now relate and link up

GIP covers all modes of transport (passenger car traffic, public transport, cycling, walking)

Headed by: irmgard.mandl-mair@ktn.gv.at
Traffic Information Service (VAO)

- a collaborative traffic information service
- covers all traffic developments (for cyclists, pedestrians, public transport, motor vehicles, Park&Ride)
- The Graph Integration Platform (GIP) serves as digital map, which is more up to date and more detailed than all conventional graphs

Headed by: martin.muellner@asfinag.at

baseemap.at

- baseemap.at is a cartographic product based on the administrative data
- It is updated bi-monthly
- The cartography as well as the underlying data are constantly updated and improved

Headed by: viennagis@ma14.wien.gv.at
OVERVIEW GIS

GIS since 2003

- Road Network
- Guideline for Surveying Data
- Software
- Hardware
- PLaDOK (Surveying Data)
- WebGIS Basic
- Inventory Data
- Geodata
- Orthophotos

Responsibility along the road
- noise protection cadastre
- surveying data
- infrastructure objects
- construction site program
- toll information
- rest areas
- traffic signs
- . . . . . .
OVERVIEW GIS
Geodata and Infrastructure

SAP
Construction site program
Employees: Responsibility, Contact information, address …

SHAREPOINT
Rest areas
Tunnel tubes information
Salt sites
Construction site projects
Maintenance projects

GIS

DMS
Reports, photos, notes, Correspondence, contracts
Official notifications, audit documentation

IMT
Database information about bridges, pavement condition, noise protection . . .
OVERVIEW GIS

GIS System Architecture

EXTERNAL GEODATA

INHOUSE GEODATA
GIS expert
Non GIS expert

GIS - DATA
basic
technical
org management
noise protection
inventory

INTERFACES
SP
AS
SAP
DMS

GIS CLIENT
ARC GIS SERVER
WEB GIS SYNERGIS WEBOFFICE
ARC GIS ONLINE
OVERVIEW GIS
Guideline PLaDOK and Surveying Data

- construction site planning
- data preparation for contractor
- surveying data processing by contractor
  - ASFINAG guideline surveying data
  - geochecker

Acceptance by ASFINAG and import into geodatabase
ASSET MANAGEMENT

• Project development: Focus to project management and coordination

• Engineering: Focus to strategy, reporting and controlling

• Structure Maintenance Management:
  - condition detection and assessment
  - project requirements and definition
  - take over of structures and routes (new / after refurbishment)
  - strategic long-term corridor planning
  - Incident management
  - take care of infrastructure database
  - technical assessment of special transports
ASSET MANAGEMENT

Bridges
ASSET MANAGEMENT

Retaining Walls
ASSET MANAGEMENT
Noise Protection Walls - Maintenance
ROAD OPERATION
ROAD OPERATION

Operational Activities – Principles, Core Tasks

- Users are customers
- Highest road availability and safety
- Highest economic efficiency
- Operation of the motorway and expressway network
- Maintenance of the necessary existing infrastructure
- Traffic management and customer information
ROAD OPERATION
Operational Activities – Finance

- Total budget 2015 - Operation EUR 122 million
  - thereof personnel expenses EUR 73 million
  - thereof material used for gritting and snow clearance (salt, brine etc.) EUR 9.4 million
  - thereof energy costs EUR 1.1 million

- Salt consumption per year approx. 80,000 t
ROAD OPERATION

Operational Tasks

- Refurbishment, upgrading & renewal works
- Road control service
- Traffic Manager
- Safeguarding road work, accident, e.g.
- Structural monitoring
ROAD OPERATION

Operational Tasks

• Cleaning rest areas & parking areas

• Reviewing and checking tunnel safety equipment and facilities

• Tunnel cleaning
ROAD OPERATION

Operational Tasks

• GIS is one of the most important tools
• All important information available on an easy way
Activities related to gritting and snow clearance services actually start in summer: fixing snow poles, re-filling salt storage facilities and adapting duty rosters

In wintertime 1,100 employees are available for gritting and snow clearance services

Ongoing monitoring of current and forecasted weather conditions

Increased control and clearance of sensitive road sections

Consideration of economic and environmental aspects
ROAD OPERATION
Winter Services

• Salt Silo:
  • Salt is the most important commodity
  • Position of the Silos
  • Coordinates for the suppliers
• Snow Clearance Routes
  • Visualisation of the routes
  • One Snow Clearance Convoy have to clear one route
  • Time of circulation 90 to 120 minutes
• Cutting grass:
  • Mowing machine convoys are used to minimise the impact on the flow of traffic
  • Which area must be cut, how often and in which kind
ROAD OPERATION

Water Protection Sites

- Position of the facility
- Interface to DMS
- List of sites for referring documents (e.g. law regulations, official notifications)
ROAD OPERATION
Drainage Infrastructure

- Position of pipes, ditches, ponds, etc.
- Flow direction
- Road drainage areas
- Outfall Point
- Described with picture and text
- List of sites for referring documents (e.g. law regulations, official notifications)
ROAD OPERATION

Natural Hazards

- Position of Hazard Spots.
  - Described with Picture, Text and hazard classification

- Position of Natural Hazard Protection Structure
  - Described with Picture, Text and protection classification
ROAD WORKS & CONSTRUCTION SITE MANAGEMENT

Expertise I

- Bundling of all planning and construction responsibilities and expertise for the effective and efficient handling of projects
- Provision of a safe network that is extended to meet customers requirements
Project planning & structural implementation of …

• New motorways & expressways
• Junctions, rest areas & traffic control points, truck parking spaces
• Capacity increasing measures (including additional lanes, second tunnel tubes)
• Maintenance works (overall refurbishment, renewal, structural refurbishment, upgrading and expansion of the safety-related systems and elements)
• Activities to reduce the impact of traffic on the environment / noise protection activities
• Structural engineering activities (building motorway operation and maintenance facilities)
• Activities to increase traffic and tunnel safety (like traffic control systems, renewal and upgrading of the electrical engineering equipment in tunnels)
ROAD WORKS & CONSTRUCTION
SITE MANAGEMENT
Requirements – Sharepoint - GIS
ROAD WORKS & CONSTRUCTION
SITE MANAGEMENT
Construction Site Program – Sharepoint - GIS
## Rest Area Concept

<table>
<thead>
<tr>
<th>Motorway Service Stations</th>
<th>Rest Areas</th>
<th>Parking Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Raststation" /></td>
<td><img src="image2" alt="Rastplatz" /></td>
<td><img src="image3" alt="Parking Area" /></td>
</tr>
</tbody>
</table>

- **Motorway Service Stations**
  - with petrol stations and shopping area, some with regular or fast food restaurants, hotel and truck service centre

- **Rest Areas**
  - sanitary facilities, parking spaces, seating areas, beverage vending machines, emergency telephones, video monitored, some with shop and playground

- **Parking Areas**
  - Basic facilities (restroom, partially lighting)
## Rest Area Concept – Sharepoint - GIS

<table>
<thead>
<tr>
<th>BEZEICHNUNG</th>
<th>STRECKE</th>
<th>RICHTUNG</th>
<th>STATIONIERUNG</th>
<th>TOILETTE</th>
<th>AUTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Omding</td>
<td>A 1 West Autobahn</td>
<td>Walserberg</td>
<td>88,035</td>
<td>Cadolto</td>
<td>Ybbs</td>
</tr>
<tr>
<td>Nibelungen</td>
<td>A 1 West Autobahn</td>
<td>Wien</td>
<td>91,655</td>
<td>keine Angaben</td>
<td>Toi-Toi</td>
</tr>
<tr>
<td>Erlauf</td>
<td>A 1 West Autobahn</td>
<td>Wien</td>
<td>94,711</td>
<td>Marbeton</td>
<td>Stugeba</td>
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<tr>
<td>Neumarkt</td>
<td>A 1 West Autobahn</td>
<td>Walserberg</td>
<td>106,811</td>
<td>WC ohne Wasserspülung</td>
<td>WC privat</td>
</tr>
<tr>
<td>Hubertendorf</td>
<td>A 1 West Autobahn</td>
<td>Wien</td>
<td>107,042</td>
<td>WC ohne Wasserspülung</td>
<td>WC privat</td>
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<tr>
<td>Gumpenberg</td>
<td>A 1 West Autobahn</td>
<td>Walserberg</td>
<td>112,273</td>
<td>WC ohne Wasserspülung</td>
<td>WC privat</td>
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<td>Oberholz</td>
<td>A 1 West Autobahn</td>
<td>Wien</td>
<td>114,296</td>
<td>keine Angaben</td>
<td>Ybbs</td>
</tr>
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</table>

**Map**:
- [Map of the area](image-url)
## Facility Management

### Table

<table>
<thead>
<tr>
<th>Nutzfläche gesamt [m²]</th>
<th>Nutzfläche Büro netto [m²]</th>
<th>umbauter Raum [m²]</th>
<th>Beheizungssart</th>
<th>Heizenergiebedarf [kWh/a]</th>
<th>gekühlt</th>
<th>Kühlenergiebedarf [kWh/a]</th>
<th>Strombedarf [kWh/a]</th>
<th>EEB</th>
<th>Heizenergie Kennzahl</th>
<th>Energiekosten [€/a]</th>
</tr>
</thead>
<tbody>
<tr>
<td>950,35</td>
<td>601,31</td>
<td>21,385</td>
<td>beheizt (-20°)</td>
<td>59,193 kWh/a</td>
<td>nein</td>
<td>0 kWh/a</td>
<td>10,566 kWh/a</td>
<td>1</td>
<td>77,693 kWh/a</td>
<td>2</td>
</tr>
<tr>
<td>3,000,75</td>
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<td>115 kWh/m²a</td>
<td>2</td>
<td>62 kWh/m²a</td>
<td>3</td>
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<tr>
<td>882,77</td>
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<td>0 kWh/a</td>
<td>0 kWh/a</td>
<td>3</td>
<td>0 kWh/a</td>
<td>0</td>
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<tr>
<td>27,00</td>
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<td>unbeheizt</td>
<td>0 kWh/a</td>
<td>nein</td>
<td>0 kWh/a</td>
<td>0 kWh/a</td>
<td>3</td>
<td>0 kWh/a</td>
<td>0</td>
</tr>
</tbody>
</table>

### Diagram

The diagram shows a schematic layout of a facility with various sections marked for different purposes. The layout includes areas designated for road works and construction activities, with specific focus on site management and facility management.
ROAD WORKS & CONSTRUCTION
SITE MANAGEMENT
Costs of building motorways and expressways

Rural area: EUR 10-25 million / km
ROAD WORKS & CONSTRUCTION
SITE MANAGEMENT
Costs of building motorways and expressways

In and around cities: EUR 60-80 million / km
TOLLING
TOLLING
Customer Service Center
General Information

• 24-hour service

• Information on all topics relating to the motorway and expressway network

• Fast, professional and reliable information in 6 languages
TOLLING
Customer Service Center
Topics*

- Telephone switchboard
- Situation of traffic
- Winter services
- Resting facility
- Road works
- App Unterwegs
- ASF iNAG Maps
- Emergency corridor
- Noise protection
- ....

Toll Topics
Vehicle of up to 3.5 t
- Vignette
- Special Toll
- Substitute toll
- ....

Toll Topics
Vehicle more than 3.5 t
- GO-Box
- Means of payment
- Datachange
- Substitute toll
- Retroactive payment
- EEK (EURO-Emissionclass)
- Toll2GO
- Easy GO+
- SelfCare Portal
- ....

- About 520,000 contacts
  - telephonic: 56%
  - written: 44%

*Distribution by topic and input channels (telephonic / written) in 2014
Challenges CSC

Rising complexity regarding content and technics

Every agent has to be trained for all topics

Agends work written beside their telephone calls

Frame conditions:
- 7 days à 24 hours
- 6 languages

Targets:
- Service Level
- Lost Call Rate
- Handling time
**TOLLING**

Tolling – Toll System in Austria

<table>
<thead>
<tr>
<th>Up to 3.5t mpgw</th>
<th>Toll sticker</th>
<th>Special toll</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Revenue*) of EUR 406 million</td>
<td>Revenue*) of EUR 147 million</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>More than 3.5t mpgw</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully electronic toll payment by GO-Box</td>
</tr>
<tr>
<td>Revenue*) of EUR 1,135 million</td>
</tr>
</tbody>
</table>

*) net revenue 2013, rounded
TOLLING
Points of Sale for Toll Sticker and GO Box
TOLLING

Technical equipment
TOLLING

Video System

• 5,100 video cameras
  • Tunnels
  • Service areas
  • Outdoor areas

• 85 video operator stations
  • Traffic management centres
  • Motorway maintenance areas
  • Emergency services
  • Co-operations with: Ö3, TW1, Puls 4

• Approx. 25 million connections per month

550 webcams (as at March 2014)
TOLLING
Video System
QUITE NEW
• **Strip Maps – Alignment Sheets**: Visualization of infrastructure objects (junctions, bridges, number of lanes, water pollution sites . . .), condition information about surface and buildings, construction site program etc.

• **Business concepts** is about road network capacity and efficiency: availability and flowing traffic, maintaining und increasing road safety

• **Prediction and future trends** 2030 / 2035: calculation is based on the traffic model 2025
NETWORK COORDINATION
NETWORK COORDINATION
NETWORK COORDINATION
NOISE PROTECTION DATABASE
Information about Noise Sections and Walls
SUMMARY
GIS Facts and Figures

GIS Team: 3 experts
Employees: 2,800

DATA*
- Data management
- Surveying Data
- Database

* ASG: 1 expert

IT
- Software
- Database
- WebGIS

USER
- Coordination
- Projects
- Trainings
Optimizing Work processes by using GIS at ASFINAG

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