10 Years of ITS in Uruguay

10 years of ITS in Uruguay
CSI has participated in projects for clients in 20 countries and currently has 8 offices around the world

With 30 years of experience and more than 100 engineers as permanent staff, we have actively participated in more than 400 projects for clients from around the world. Today we have a global presence with offices in South, Central and North America and Africa. The firm is headquartered in Montevideo, Uruguay.
CIEMSA provides engineering, construction, operation and maintenance services as well as equipment supplies.

- Providing services to private and public sector clients since 1980.
- Increasingly focused on turn-key projects and value-added services, including 24x7 operation and maintenance.
- Experience in projects funded by international agencies, including the World Bank, Inter-American Development Bank and United Nations Development Program.
- Multidisciplinary team of over 1,000 people, complemented by local and international experts as required.
## Status of Weigh Enforcement Systems in Latin America.

<table>
<thead>
<tr>
<th>Country</th>
<th>Static Weighting</th>
<th>SSWIM Weighting</th>
<th>Dimension Control</th>
<th>BOT Systems</th>
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<tbody>
<tr>
<td>Nicaragua</td>
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<td>Honduras</td>
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<td>Uruguay</td>
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</table>
Uruguay – Oregon comparison. Some interesting facts

<table>
<thead>
<tr>
<th>Facts</th>
<th>Uruguay</th>
<th>Oregon</th>
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<tbody>
<tr>
<td>Km2 (sq.mi)</td>
<td>176,215 (68,037)</td>
<td>254,806 (98,381)</td>
</tr>
<tr>
<td>Population (million)</td>
<td>3.41</td>
<td>3.79</td>
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<tr>
<td>GDP USD/cap</td>
<td>12,300</td>
<td>41,700</td>
</tr>
<tr>
<td>Km road (mi)</td>
<td>8,700 (5,406)</td>
<td>12,936 (8,038)</td>
</tr>
<tr>
<td>WIM stations</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td>Truck fleet</td>
<td>40,000</td>
<td>500,000</td>
</tr>
<tr>
<td>Weighted trucks (2008)</td>
<td>1,000,000</td>
<td>3,500,000</td>
</tr>
</tbody>
</table>

Weighted Trucks (including WIM and static scales)
(Source: Oregon Department of Transportation and Uruguay Department of Transportation)
<table>
<thead>
<tr>
<th>ITS SYSTEM</th>
<th>FEATURES</th>
<th>CHARACTERISTICS</th>
</tr>
</thead>
</table>
| WIM Weighting System               | • 11 WIM stations in National roads  
• 4 WIM at ports of entry       | • Weight Enforcement  
• Web-based document control  
• 3D dimensions control with laser scanners |
| Traffic Monitoring System          | • 10 permanent stations with WIM capabilities  
• 52 seasonal stations          | • Cell phone based data transmission                                           |
| Toll Systems                       | • 14 Toll stations  
• 34 lanes with RFID antennas  | • RFID low cost passive Tag system                                              |
| Transit monitoring via video detection | • Traffic signal wireless controller at main access of Botnia pulp mill  
(world largest pulp mill, 4 million tons wood/year - wholly truck transportation) | • Transit control of traffic to nearest city (Fray Bentos) and truck access to the pulp mill  
• virtual loop sensors  
• Remote monitoring |

**Uruguay’s ITS systems current status**
Weigh Enforcement with WIM Technology

• Weight Enforcement in Uruguay.
• Best practices achieved in Uruguay.
• Obtained results.
Weight Enforcement in Uruguay

• By 1998 MTOP (Uruguay Department of Transportation) decided to upgrade its truck weighting policy in order to:
  • Reduce overweight,
  • Improve % of weighted trucks

• MTOP implemented a BOT project with CSI/CIEMSA contract, with the following goals:
  • Achieve a country-wide WIM system coverage (with permanent and seasonal stations) along the entire road network, operating 24/7.
  • Achieve an immediate response to any emergency of the system.
  • Achieve full Transparency and Reliability of the system.
  • Align relevant stakeholders.
Achieved Results

• Country-wide WIM system coverage achieved with 24/7 response. What is more, an Integrated Enforcement System was implemented.

• 1.1 million of weighted trucks by Dec 2009.

• 60% of the registered truck fleet is to be controlled by Dec 2009.

• Wide acceptance of the system by truck associations and public authorities (MTOP). Successful alignment of relevant stakeholders.

SOME ADVANCES BEYOND THE ORIGINAL CONTRACT:

• Real time web-based management system of WIM stations (WIM Report) with access to the whole information dataset and historicals, enhancing even more the transparency standards. WIM Report.

• Dimension measurement laser system (error less than 5 cm).
Key elements for successfully complete the goals and move forward:

- Implementation of a state of the art, suitable and **reliable technology for WIM weighting**

- Successful implementation and compliance of **strict control and operation procedures**

- **National Regulatory Framework** in total accordance and aligned with all processes

- Communication and diffusion strategy for **align the relevant stakeholders** (truck associations, operators, public authorities, others)
State of the art, suitable & reliable technology implementation

State of the art, suitable & reliable technology was implemented through:

- Strict accomplishment of international norms and standards COST 323 and ASTM E1318 at erection stages.
- Rigorous maintenance plan and equipment calibration procedures.
- ISO 17025 Certification of weighting control system.
Strict Control and Operations Procedures

- Definition and track of operation parameters
- Regular on-site checks of the station performance
- Strictly enforcement of maintenance and calibration plans
- Continuous evaluation of the operative personnel
National Regulatory Framework

• Weight tolerance rules and norms for National Roads
  – Definition of maximum weights per axle types, per axle groups and net gross weight
  – Definition of network segments as “corridors” allowing more load at triple axle group
  – Tolerances: 5% in axles (30% transitory) and 3% in net gross weight.
  – Establish fines according to a classification: slight, medium, severe and ultra severe

• Metrologic rules and norms:
  – Establish requirements and sampling methods for instruments related to weighing in motion
  – Applicability: Instrumentation located at a controlled area (weight station)
  – Requirements: Net Gross Weight within +/- 2% , for axle and axle groups +/- 3%.
  – Methods: Referenced by European norm COST 323, OIML R134-1 y ASTM E1318-02.
Communication and diffusion strategy for align the relevant stakeholders

State level (Department of Transportation):
- Inspectors
- Administration technical staff
- Political staff

Key message: transparency, reliable and highly versatile system for implementing a much better enforcement

- Cargo operators:
  - Transport Associations
  - Large load generators

Key Messages:
- Reliable
- Rapid control reducing delays and generating strong cost savings
- Transparency
- Fairness sentiment - fostering true competitiveness and improving the percentage of enforcement
Traffic Monitoring System

- Uruguay current status
- Best Practices achieved in Uruguay
- Obtained Results
Traffic Monitoring System. Main Characteristics.

- System composed of three different data collection programs, linked to three types of counting stations:
  - Permanent,
  - Seasonal,
  - Coverage
- The project’s main objective is to produce an annual map of traffic at the network.
- The criteria for data collection as well as data processing are strictly statistical.
- The system operation complies ISO 9000 quality standard.
- The project and the operation of the system is responsibility of a private company (CSI Ingenieros) under the supervision of DNV (National Highway Administration).
Traffic Monitoring System.
Permanent Stations.

- **10** permanent stations located on the main highways, which perform:
  - Counting,
  - Classification,
  - Speed,
  - Weigh-in-motion of vehicles
- The stations operate 24/7.
- The equipment ECM Hestia P is configured 2Piezo and 1 magnetic Loop.
- Each station is equipped with cellular phone and modem that allows remote monitoring and data transfer.
- Each station is powered with 12 V (100 Amp) batteries and solar panels, or 220 V energy.
Traffic Monitoring System.
Seasonal Stations.

- **39** seasonal stations located in the primary and secondary network which perform:
  - Counting,
  - Classification,
  - Speed,
- These stations operate one week every 2 months.
- The objective of these equipment is:
  - to increase network coverage.,
  - better understand seasonal traffic variations.
- The equipment ECM Hestia C is configured 1Piezo and 2 magnetic Loop.
Traffic Monitoring System. Main Use of the information.

- SPSS software for statistical analysis is used for processing data collected.
- Two data programs were designed and developed to fulfill the project objectives:
  - Traffic behaviour characteristics using information supplied by PS.
  - The second program uses information form SS for coverage information that is processed using seasonal variation factors from PS.
- The result is the following data obtained from PS:
  - Classified volume, by month and year, by lane and direction of travel.
  - Average speed, percentile 5, 15 and 85, percentage of vehicles that exceed the maximum allowed speed, accumulated distribution of speeds; by direction of travel, for cars, buses and trucks, presented by month and year.
  - Total weight, by group of axles and by axle, determination of the percentage of vehicles unloaded and overloaded; monthly presentation for all categories of heavy vehicle.
  - ESAL coefficients of all heavy vehicles registered during the year; by lane.
  - Calculation of hourly, monthly and annual variation coefficients.

- The design of this type of system requires considerable research. Suppliers advice should be analyzed with critical spirit in order to make sure that the purchased technology is appropriated.

- The standards imposed by regulatory institutions (ASTM, AASHTO, etc) must be respected in order to ensure the equipment functions well.

- A special consideration must be taken in the calibration procedures. ASTM E1318 or COST 323 standards must be followed in order to have accurate results.

- This project has achieved compliance with the standard’s requirements and has obtained excellent results. This is based on important work previously done in data collection, re-paving and pre-testing, as well as on a detailed installation design, careful installation and adequate supervision.
Electronic Toll Collection System. Main Features and Characteristics.

• The government gave free tags to 14,000 frequent users of the most important Toll Station.

• It have great success and acceptance. Nowadays the system operates with less than 2% of tag reading error in the ETC lane.

• The ETC was installed as an alternative to increase the capacity of the two more important Toll Stations from Uruguay.

• The challenge is to generate a massive use of the Tag, by giving:
  • other benefits or services to the owners. For example, parking services, Electronic Payment at fuel pump stations.
  • And the Government, electronic licence plate, etc.
CCTV Traffic Control at main gate of Botnia pulp mill. Main Features and Characteristics.

- The intersection is monitored with a video detector Autoscope Solo Terra from Econolite.
- The system controls the “T” intersection, operation of traffic lights.
- The project objective is to organize the crossing of the vehicles that enter/exit the plant, from others vehicles that travel from to the city and port of Fray Bentos.
- The system is designed to allow permanent flow with green light for traffic identified as M1 and M2.
- The video system detects with a virtual loop detector the maneuvers M4 and M3, activating the signalized intersection sequence.
- The video system counts and classify the vehicles.
- All the system is remotely monitored from the Control Center in Montevideo City.
Thank you!

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