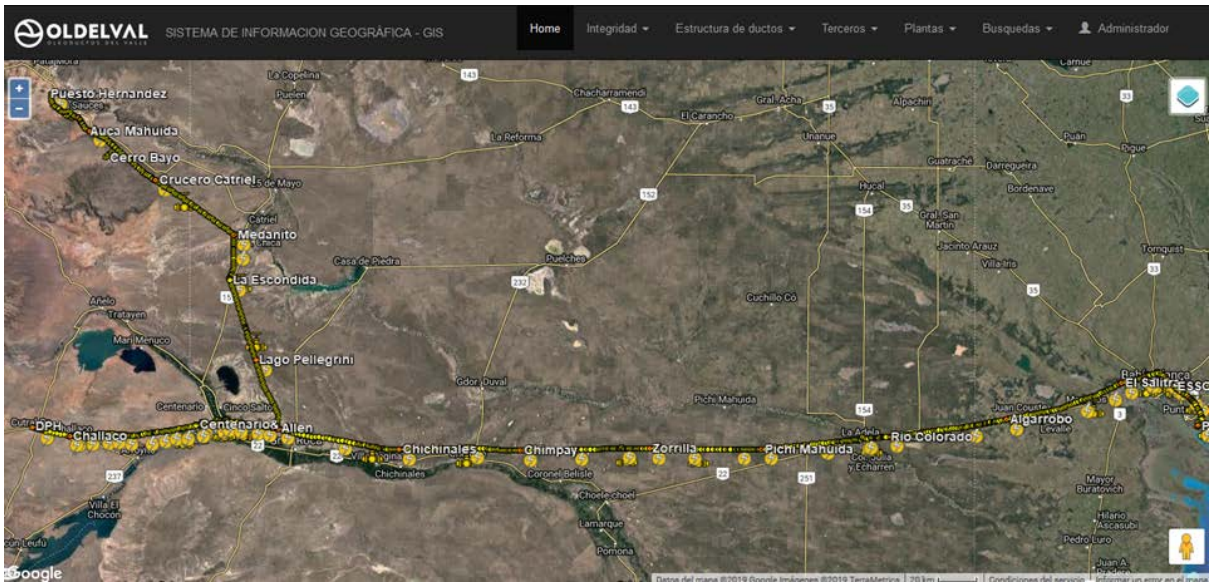
Description

The GIS System is a comprehensive system for the administration of infrastructure and the Pipeline risk analysis in a Geographic Information environment. He is focused on two of the main aspects that make up the current problem of pipeline operation Information management and Risk Analysis and Assessment. Both aspects stand out specifically to the Management of the integrity of these ducts.

In addition to the aforementioned, GIS attends with total fairness to what is expressed by provision 120/2017 of the Secretariat of Energy of the Argentine Nation, which applies to the transportation of liquid hydrocarbons through pipes. This Technical Regulation requires, as necessary factors for integrity management, the conformation, a unique and geo-referenced database and the evaluation of the risks and consequences of failures using a risk analysis method.

From 1999 to the present GIS stands out as the most suitable alternative for regulatory compliance and as the indicated tool for information management of its pipelines.



Infrastructure management
Through a georeferenced environment, the user processes the existing information in the Databases, achieving responses to their requirements in various ways for their analysis and evaluation:
Graphics, Reports, Geographical views, Thematic maps, etc.

Risk Analysis and Assessment
Process the existing information in the databases and through a proven algorithm effectiveness establishes risk and consequence indexes of failure.
This result can be presented to the user in various ways, either through a graph, a report or through a risk map.

Most Outstanding Features

- Customizable development for the problem of oil pipelines
- Web System Access from the browser (Internet Explorer / Chrome / Firefox)
- Strongly linked geographic and alphanumeric data
- Publication, Distribution and Display of information
- Structured Data in Relational and spatial Data Base
- Friendly interface and suitable to the needs of the Operator

Detail and origin of the information that integrates GIS

Description by topic

1. Topology / Topography of the pipeline:

The geographical location and geometry of the pipeline are fundamental values for GIS. Most of this information already exists in the operator and it is CAD-type files. They refer to a coordinate system to allow its correlation with other components of the system (hydrology, roads, urban areas, exploitation areas, etc.). GIS integrates these into a single, geo-referenced environment allowing scalability and future incorporation of more information. This starting information is incorporated into the spatial database, manipulating all geographic information in a much faster and more efficient way than if it kept its original format.

2. ILI:

Reports of the internal inspection tool or instrumented pig.

The contractor that performs the inspection delivers the results of the inspection, together with specific software for analysis, GIS accesses these reports to allow users to correlate them with the rest of the information in the pipeline

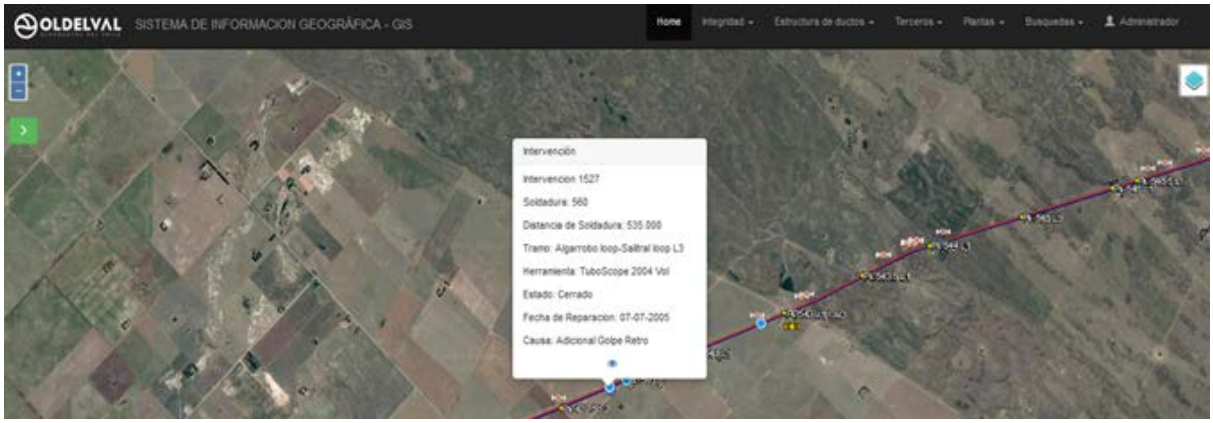
3. Cathodic Protection:

Report of the CP, CIS and DCVG readings in the pipeline. GIS provides tools for importing periodic CP reports, since the treatment of this data is mostly handled by specific software or outsourced by the operator.

4. Soil Properties (PH, Resistivity, etc.):
Data from the land where the pipeline is installed are used to evaluate the effectiveness of the CP. A graph showing the results of the PC surveys together with soil data is very useful to measure effectiveness and act accordingly.

5. Repairs:
Reports of the repairs carried out in the pipeline. Most of the pipeline repairs are used to gather information related to the environment, details of tests or analyzes that could be carried out, the state of the lining and other observed data.
The faults found are also detailed, which are compared with that reported by the ILI. It is common to describe the actions taken: placement of shirts with their details in terms of their type, length, etc., types of coating and areas covered. The repair log is then used to lower the failure rate and can also be used to measure the degree of precision of the ILI. Repair records are generated permanently, although average frequency has a peak in the generation after the analyzes originated by the ILI. GIS supports the customization required to incorporate these parts of intervention, registering the data appropriately.

GIS system has an off-line app that allows them to be loaded at the intervention site (generally remote areas with little or no possibility of connection) that then synchronizes with the GIS server to update the database



6. Easement:
The cadastral information referring to the lots or land through which the pipeline passes or where the system's facilities are located, as well as the registration data, owner, contact data (those that are useful to generate permits), data from the affectation and other associated information such as a sketch of the affectation or a measurement plan, are very useful in the operation in case of contingencies or field campaigns. GIS supports this information and integrates it into its database to provide the user with the access to this information in a very simple way.

7. Pipe Design:
The description of the duct design data such as diameter, material type, cap, material specific data, thickness, installation / manufacturing date, MAOP etc, are found in GIS very quickly and intuitively.

8. Geographical environment:
GIS integrates with Google maps for a joint use and a correct global vision of the pipeline and its environment.

9. Cathodic Protection Equipment:
The location of the cathodic protection equipment as well as the technical data of these, the detail of the readings referring to the power, running hours, current delivered, etc. are incorporated into GIS for the correct analysis of the CIA CP system.

10. Product Information:
The laboratory data of the transported product is used by GIS in the calculation of risk and consequence of failure.

11. Loss Register:
The supply from the loss and failure register is invaluable information for the operation and for the Risk analysis. GIS provides the tools to analyze them, allowing their visualization in context and statistical reports that accompany correct decision making.

12. Facilities:
The registry of plants or other locations in the pipeline system, data on their location, description of the installation, etc. as well as the proper positioning on the map, allow the user to know precisely the system infrastructure. GIS also admits the linking or aggregation of documents related to these entities such as installation plans, fire network, contingency plan, etc.

13. Crossings roads / rivers / LAT etc.
The events that occur throughout the system, such as river crossings, roads, power lines or interference, plus the highlighted information of these are of vital importance for the analysis of risk and consequence, as well as for making decisions in the field of the CP for example. GIS complements this information with the possibility of associating documents (photos, sketches, documents from the pipeline engineer)

14. Valves.
He details the location and design data of the system valves, plus documents associated with these are other facilities provided by GIS.

15. Population.
The location of the population as well as the most relevant data of these are admitted by GIS for the user's knowledge and for the correct evaluation of Risk and Failure Consequence.

Infrastructure management

Display

GIS provides, through a powerful graphic engine, visualization at different scales of the information related to:

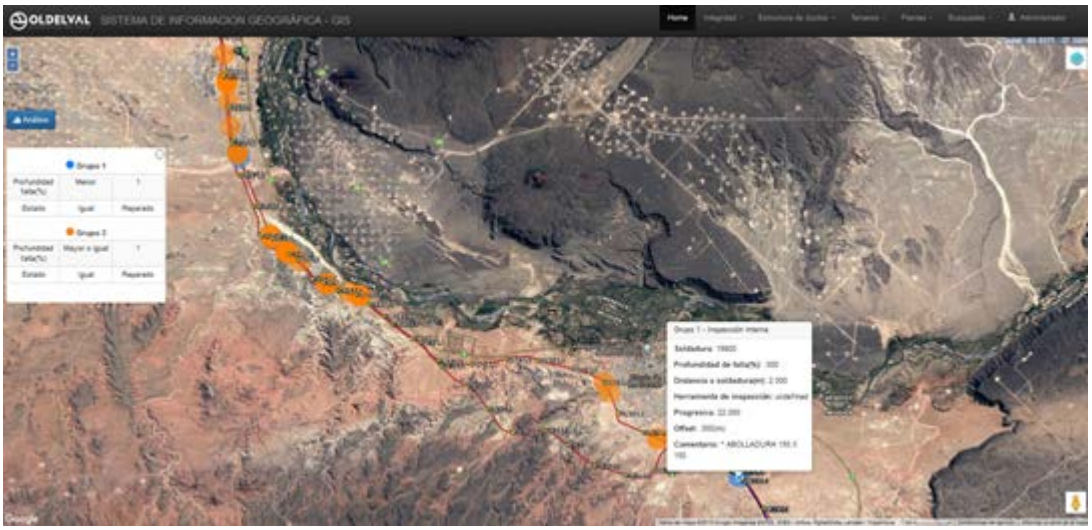
● Trace of the ducts (refers to the geometry of the duct, the milestones or progressive kilometers and blocking valves)

● Locations (pumping stations, PTC, etc.)

● Elements related to the duct (Cathodic protection units, corrosion coupons, registered losses)

● Characteristics of the pipeline trace (crossroads, affected lots or plots, high or medium voltage lines and other characteristics that compromise the pipeline)

● Other elements of the geographical context that provide greater detail (routes, roads, limits, hydrology, urban planning)



The information is presented in various layers or layers that have an adequate style and scale for its correct visualization.

The user can use tools to zoom in or out on the map, turn layers on or off, print, measure distances, etc.

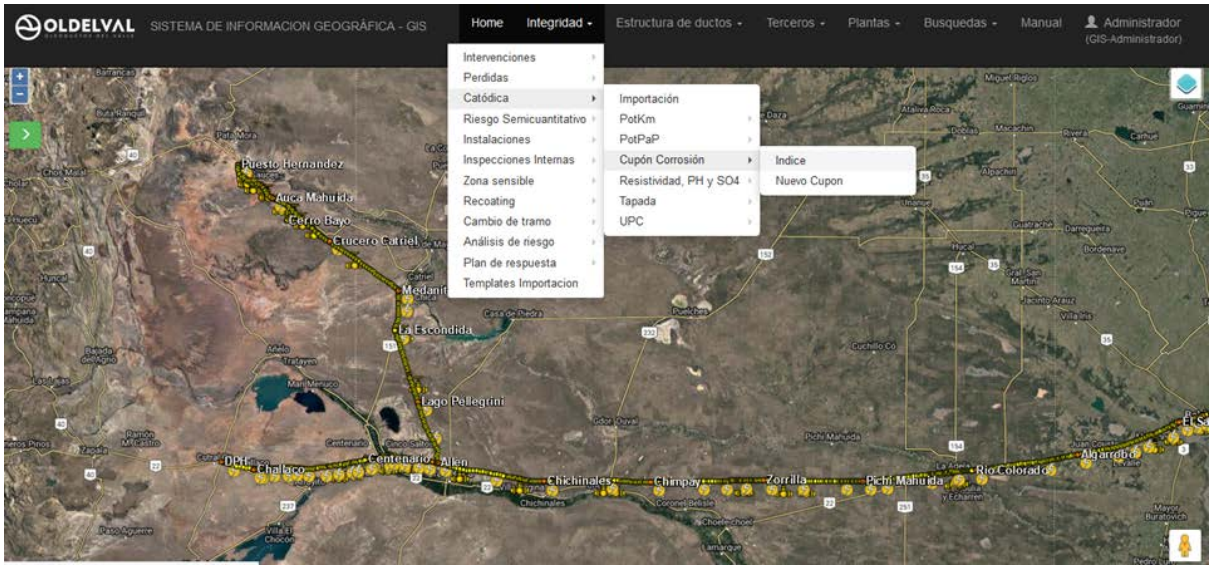
Direct location on the map.

The application provides a tool so that the user can quickly visualize (thanks to the spatial DB engine) in the context of any of the following map entities

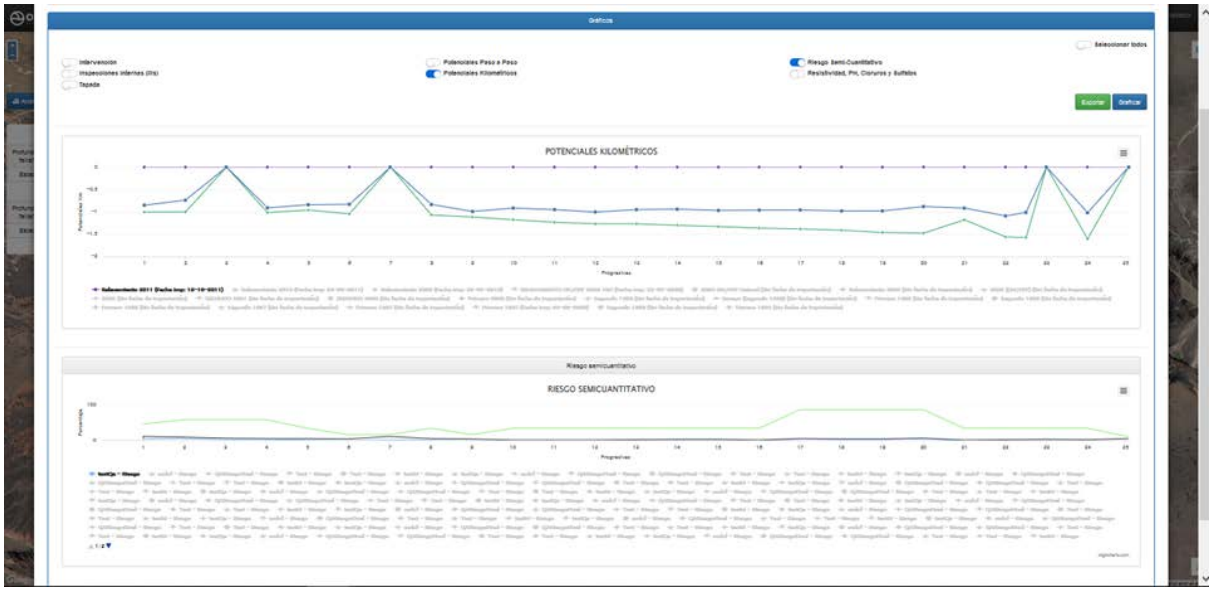
- Progressive kilometers
- Valves
- Pumping Plants or Stations
- Welding (According to the ILI registry)

- Related data queries
- By selecting different elements on the map, GIS allows access to the following information:
- Planial-metric profile document of the selected section
- MAOP records for the selected section

● Welding data (Pipe design, ILI records, Repairs made)
● Crossings (Type of crossing, Location, Coordinates and related Documents)
● CP record (Table with survey date and Reading ON / Off) when selecting a point
● CP Station
● Losses (Data of the loss record)
● Lot or Parcel (Matricula Cadastral, Owner, Data of the property, affectation,
● Related documents)
● Corrosion coupon data and readings made
● UPC (Cathodic Protection Unit) data, technical data and surveys.

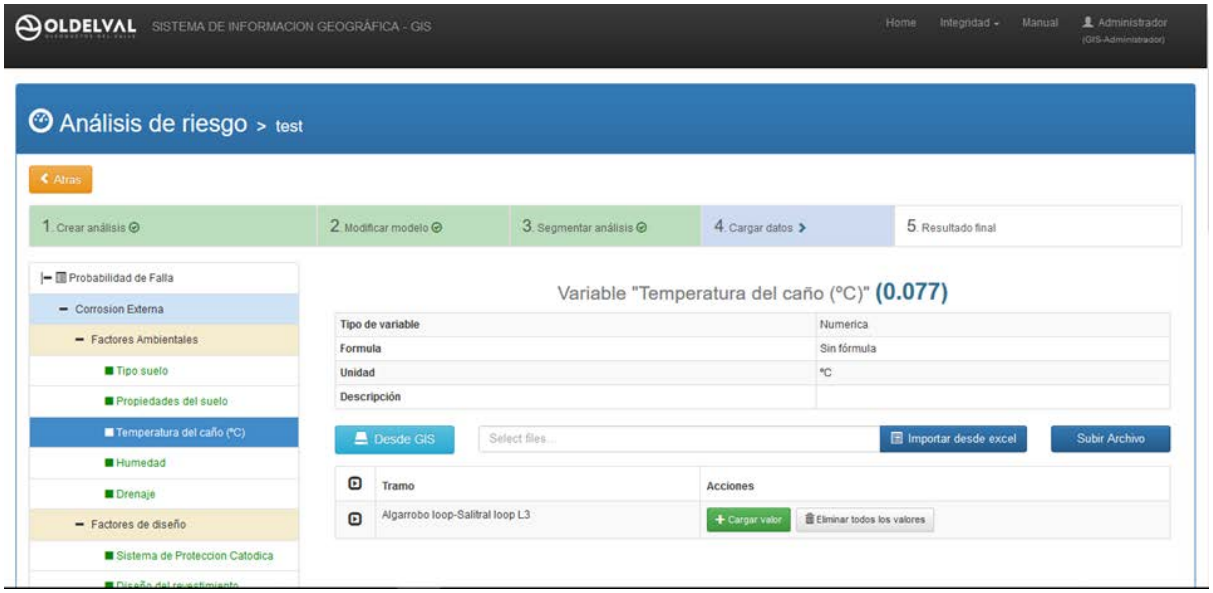


Data volume reports.
● Graphing the ILI results on the map. The user selects a section of the pipeline and an internal inspection tool, GIS graphically displays the result of said inspection along the pipeline section.
● Losses in a tranche for periods. Detail of the losses registered in a pipeline or in a
● section of it. Export to CSV
● ILI results in a pipeline or a section of it. Selection of the tool, type of events to be reported, parameters. Export to CSV
● Record of interventions in a pipeline in a section of it.
● Repairs made. Placed shirts.



Data sources that it integrates
- Vector files: Sdf, Shp, DWG
- Spatial data: Oracle (9i R2 And 10g R1), Microsoft SQL Server, ArcsdeTM 9 On Oracle And SQL Server, SDF +, Mysql
Risk Managment

GIS implements a model of relative risk analysis, based on the technique developed by kent muhlbauer. This technique weighs the different variables that influence the risk and the consequence of the failure, affecting different indices, such as: external corrosion, internal corrosion, failure by third parties, material design, operations and procedures, soil movement, scc for risk and impact on the environment, impact on the population, impact on the business for consequence.
The algorithm searches for the values for the intervening variables within the database and in the selected section, which was previously dynamically segmented.
As a result, it assigns to each segment a value for each ordered index and from these it obtains the final value of risk and consequence.
It should be clarified that the value obtained for each segment is a relative value, since it arises from the comparison and proportional allocation of the weights of the variables between the segments.
The results obtained can be known through various reports, graphs or graphical representations on the map. There is also the possibility of modeling situations, establishing alternative values for some of the intervening variables or altering the incidence of these in the model.
This functionality provides a powerful tool to prioritize the actions to be taken based on a relative ranking of risks, thus optimizing the allocation of resources. It is very useful for a good administration of the funds available for maintenance, modifications, inspections, repairs, etc. The Analysis model used is supported in the Database, and can be adapted to the standards of each company.



Technical data and requirements

● GIS has its main functionalities in a WEB-Enabled application. It is a Client-Server application developed on PHP.
● Integration with Active Directory for access and permission management
● Database: Uses a relational database model with spatial data support.