Contributing to a correct allocation of the calorific power, a way to diminish unaccounted for gas

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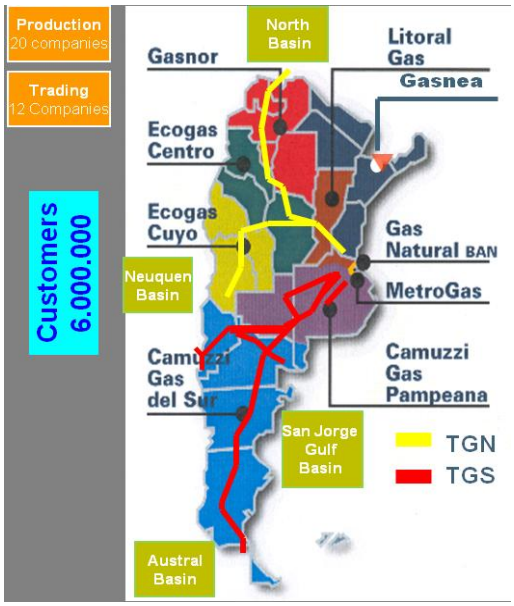
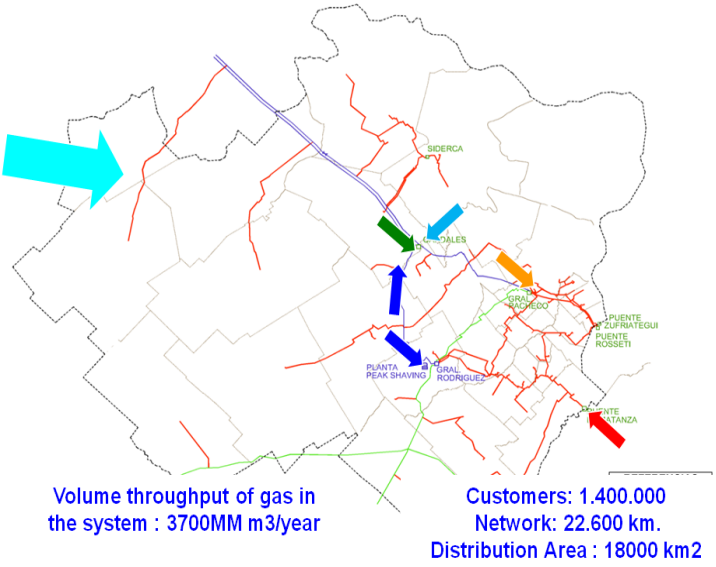
Business Scenario

The study case was developed in Argentina a mature natural gas market.





Volume throughput of gas in the system : 3700MM m3/year

Customers: 1.400.000
Network: 22.600 km.
Distribution Area : 18000 km2

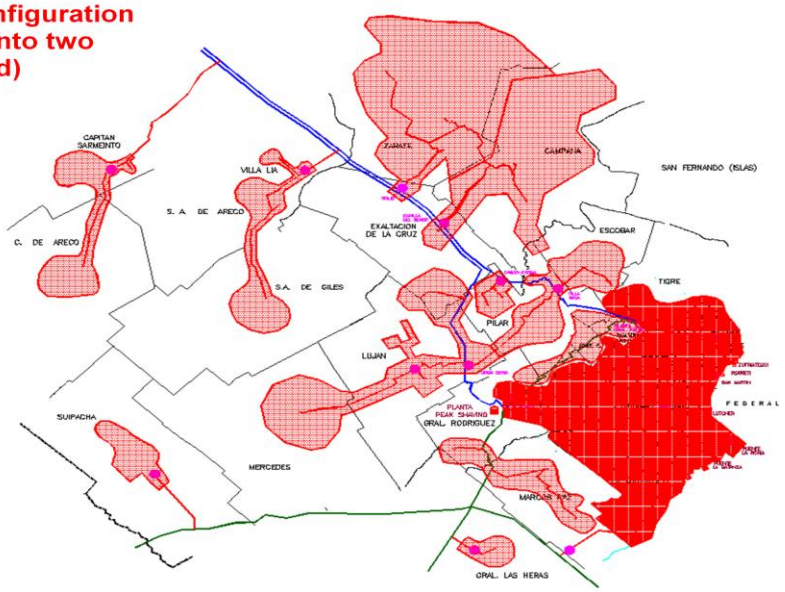
The business scenario is a distribution company located in the North West Buenos Aires area.

These are the main characteristics data of the distribution situation:

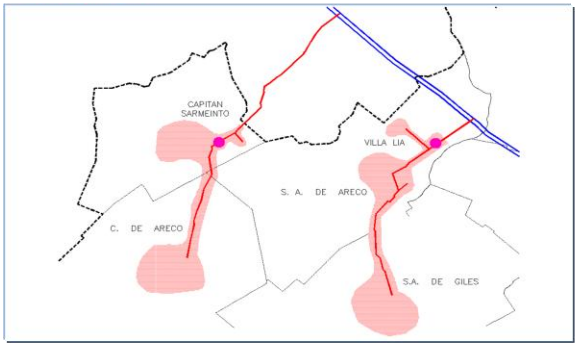
Volume throughput of gas in the system: 3700MM m3/year
Customers: 1.400.000
Network: 22.600 km.
Distribution Area: 15.000 km2 of the North West Buenos Aires area in Argentina

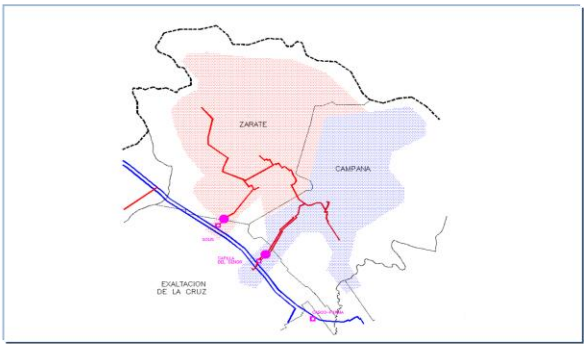
As it is shown in the pictures below, the network configuration of the distribution company can be divided into two areas; we will call them pink & red for better identification and understanding of the operation situation.

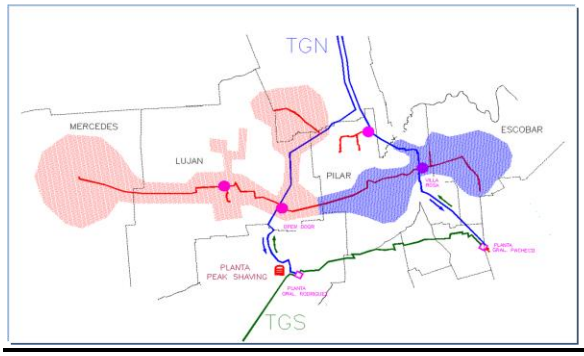
The network configuration can be divided into two areas (pink & red)



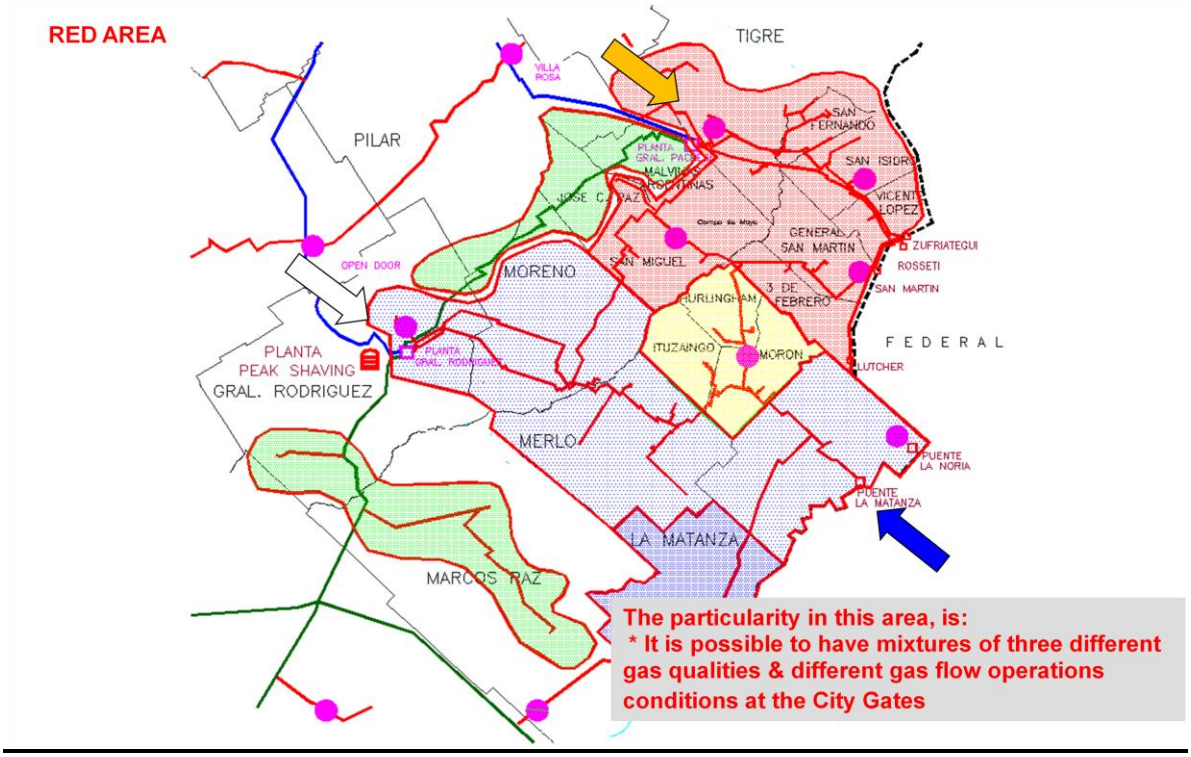
PINK AREA







The system is easier to manage, because there are isolate networks where the Transco's are involved on independent city gates.
8 continuous samplers are utilized



At the Pink Area the system is easier to manage, because there are isolated networks where the Transco's are involved on independent city gates. 8 continuous samplers are utilized.

By the other hand, at the Red Area it is possible to have mixtures of three different gas qualities & different gas flow operations conditions at the City Gates.

What was really happening?

Different gas flows entering into a distribution system with different calorific powers (c.p.), and mixing inside it.

The particularity in the red area, is that if all city gates are operable it is possible to have mixtures of three different gas qualities proceeding from different sources and presenting dissimilar compositions and calorific powers.

What was the purpose of the project?

Develop a methodology for a correct allocation of the c.p. in order to diminish unaccounted for gas (UFG).

This paper does not pretend to generalize the results in different scenarios. It shows the successfully applied of the methodologies and tools used in this particular case.

Key Findings

How was the job organized?

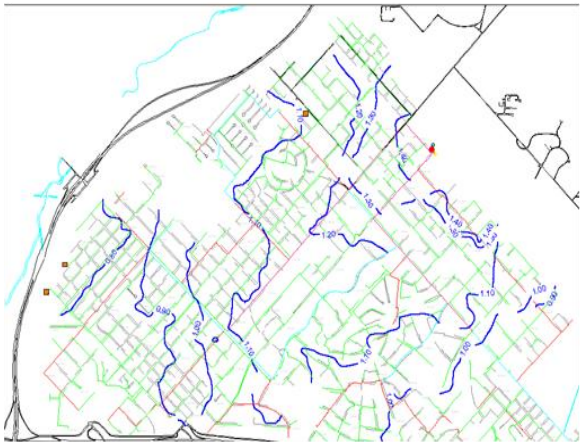
A flow study was made to know how the gas evolved in the system, in order to take the proper decision about the places to install the sampling equipment.

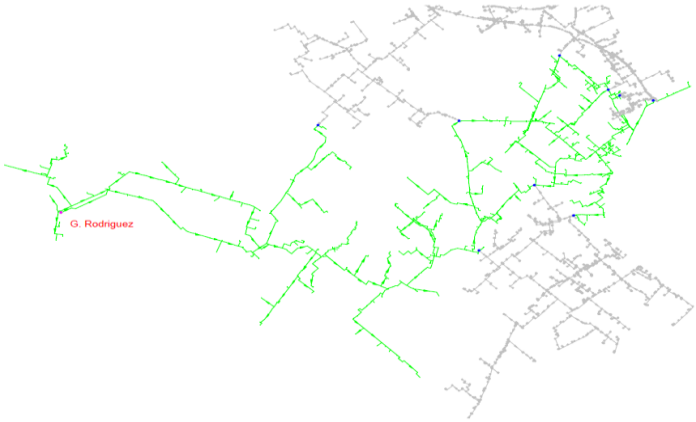
In order to know its behavior, the network simulation was done taking in consideration different scenarios (winter or summer time, f.e.).

The gas composition fluctuation in certain areas of the network was observed in certain areas of the network and the relationship with the gas flow was determined.

Samples were taken to identify the possible boundaries related to the influence of different gas qualities.

The pictures below shows some of the graphical outputs of the networks systems analysis for the gas quality boundaries determination.





What tools, technologies or methodologies were used & which are the resources involved in the project?

Infrastructure action plan

As a result of the evaluation of the gas composition, a methodology was adopted for measuring the quality of the gas through 11 continuous samplers and 3 line chromatographs which take samples proportional to the flow of circulating gas.

This scheme covers all possible operating conditions and takes care for any change because the samplers are located in order to have control of all possible gas mixtures within the area.

The pictures below shows some of the installed equipments and works performed on the facilities.

Sampling Program

The withdrawal of the cylinder samples program in a period of 15 days coinciding with the calendar fortnight + / - 1 or 2 days taking into account weekends.

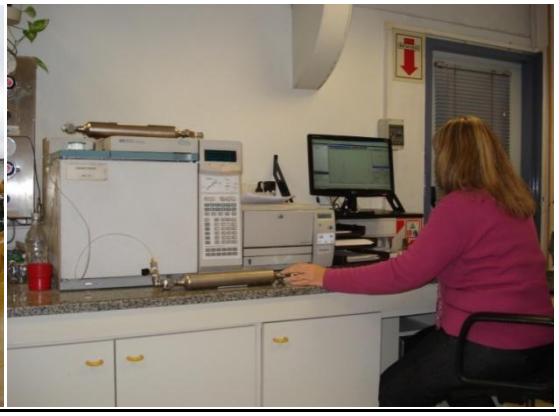
Default routes are set to make the withdrawal of cylinders in one day by two teams.

Samples are transported to the laboratory and analyzed by gas chromatography according to the guidelines of ASTM D 1945.

The calorific value and the relative density of natural gas correlations are calculated from the chromatographic analysis by the method of calculation described in ISO 6976.

The capture of the chromatographs data line is done on-line and on real time.

The pictures below show an automatic sampler and a chromatograph analysis operation.



Calorific Power for billing

After the technical analysis of all the results and the assigning of calorific values per zone are done a report of results is sent to the billing department to enable them to calculate the volumes that are billed to each residential-commercial customer each two months and for each industrial customer monthly.

As each continuous samplers involve a particular billing area, before shooting a billing process it is very important to check the process with a technical analysis which takes into account:

a) The operation of the continuous samplers (pulses and pressure)
b) The operation of the line chromatographs
c) Comparison of data obtained with those reported by the Transmission Companies
d) Network operating conditions
e) Volumes admitted throw the city-gates

Once all the above parameters are technically analyzed, the calorific power assigning process is performed.

It is important to remark that the Regulatory Authority performs periodically audits related to the determination of the calorific value and its impact on the billing process.

What is the time frame?

12 months for the first results

Results

What results is the project helping to produce?

- Correct allocation of the c.p. in a dynamic distribution system
- Continuous sampling highly representative of the quality of the distributed gas
- Structured data base supporting the billing process
- 1200 chromatographic analysis per year

What is the value of the results?

22 MMm3/year potential UFG under control.

Conclusions

What lessons were learned from the project?

- ✓ It is possible to solve complex problems with usual and known tools. The point is which ones & how.

What good practices were identified?

- ✓ To assure the measurement´s quality, specially chromatography as primary data, a programmed test routine with third parties labs was implemented.
- ✓ Chromatographs tests are performed each two weeks with a reference laboratory and reference materials.
- ✓ Once a year preventive maintenance and operational skills are done to ensure the chromatographs operation.

What are the main benefits?

- ✓ You can minimize U.F.G in a proper and intelligent way with a high level of success.
- ✓ The Project allows to allocate as better as possible de c.p. in order to diminish U.F.G.

What are the critical issues?

- ✓ The field operations logistic, the continuous maintenance of the equipments and the databases administration.

How could the initiative be improved or maintained longer?

- ✓ To demonstrate traceability of measurements, The Gas Quality Laboratory has its processes certified under ISO 9001:2008.