Pietro Fiorentini

TERRANOVA
INNOVATIONS FOR UTILITIES

retipiù

LIFE13
Green Gas Network

LIFE13 ENV/IT/000536

with the contribution of

Life

Layman's Report 26 September 2017

INTRODUCTION

It is well known that water networks, even the best maintained, all have a loss of resource to some level. Few know, however, that the same thing happens with gas: these are losses due to the micro-leaks with no consequence to the areas involved, and are proportional to the pressure present in the gas pipeline.

This is a topic which might seem paltry, and for which, up to a short time ago, there were no real ways to intervene, in an industry which has always been fairly conservative from a technological point of view. But today, the innovations tied to digitalization allow for the development of new projects, even in gas distribution: including the possibility of reducing to a minimum any losses.

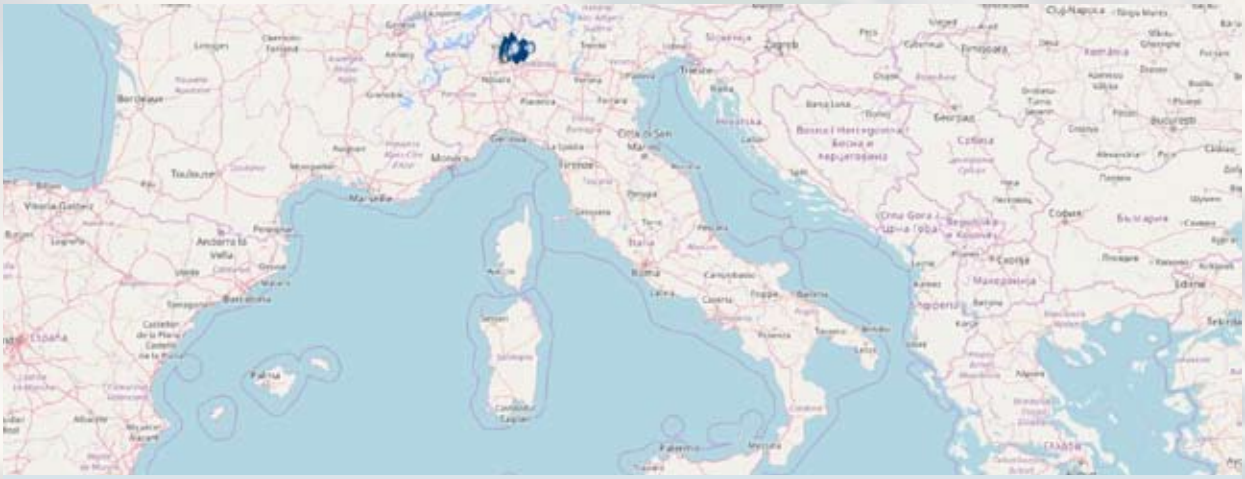


fig.1: geo-location of test area

And this is the goal of Life “Green Gas Network”, led by Pietro Fiorentini spa – a company from Vicenza , leader in the gas distribution industry- and as partners RetiPiù gas distribution Company in Brianza and Terranova

, leader in the software solutions for sales and distribution processes. Having now reached the end of three years of work, after two years of laboratory testing, the project has been upgraded with live experimentation in a test area. For about a year, in the two towns of Cesate and Albiate, near Milan (about twenty thousand habitants) (ig. 1 and ig. 2), gas distribution stations have a device which allows the pressure variation depending on the load, use and need: in practice, what has already been happening for some time in the electric distribution network but with the primary goal of reducing CO2 pollution.

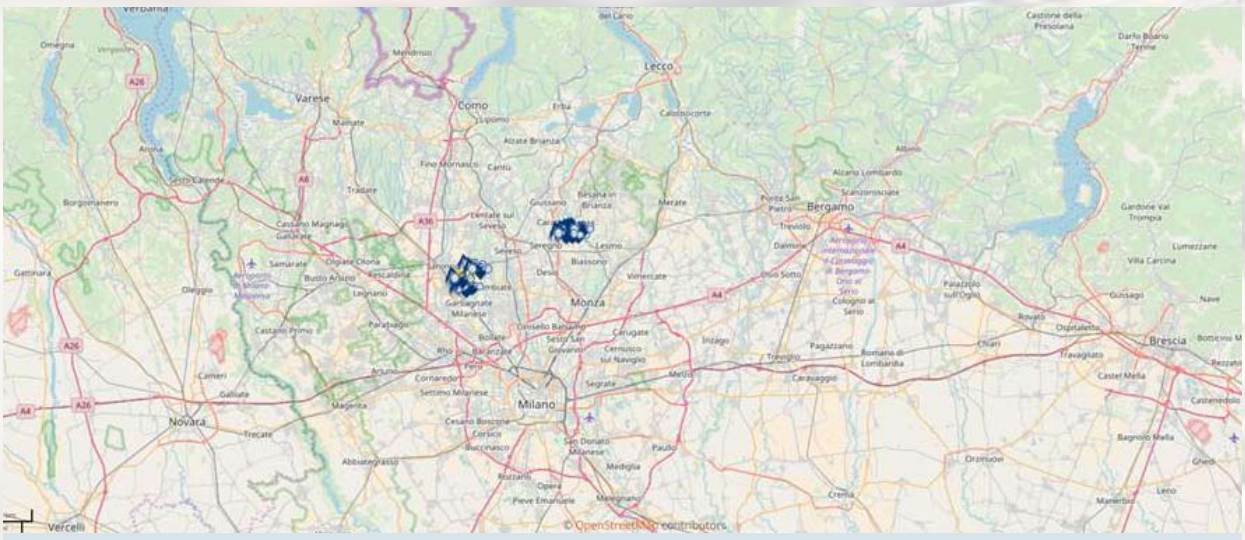


fig.2: Cesate and Albiate (MI)

THE PROJECT

On average, the demand for gas is not linear throughout the day: consume occurs in the morning, when the heaters are turned on, people shower and prepare breakfast; then it goes down, it goes up again at lunch, back down in the afternoon, peaks again in the evenings; and at night everything is off.

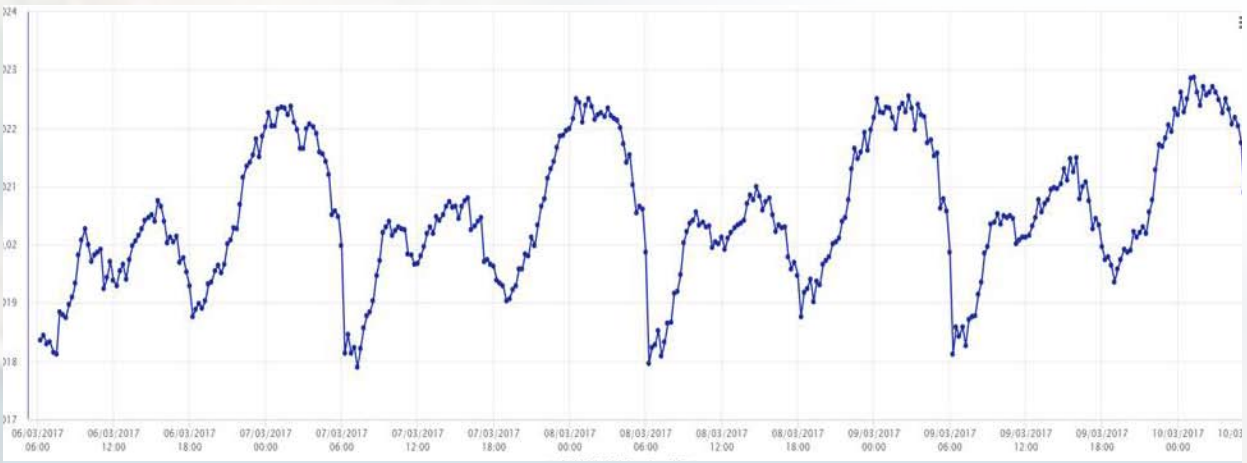


fig.3: over time pressure graph detected downstream a PRMS

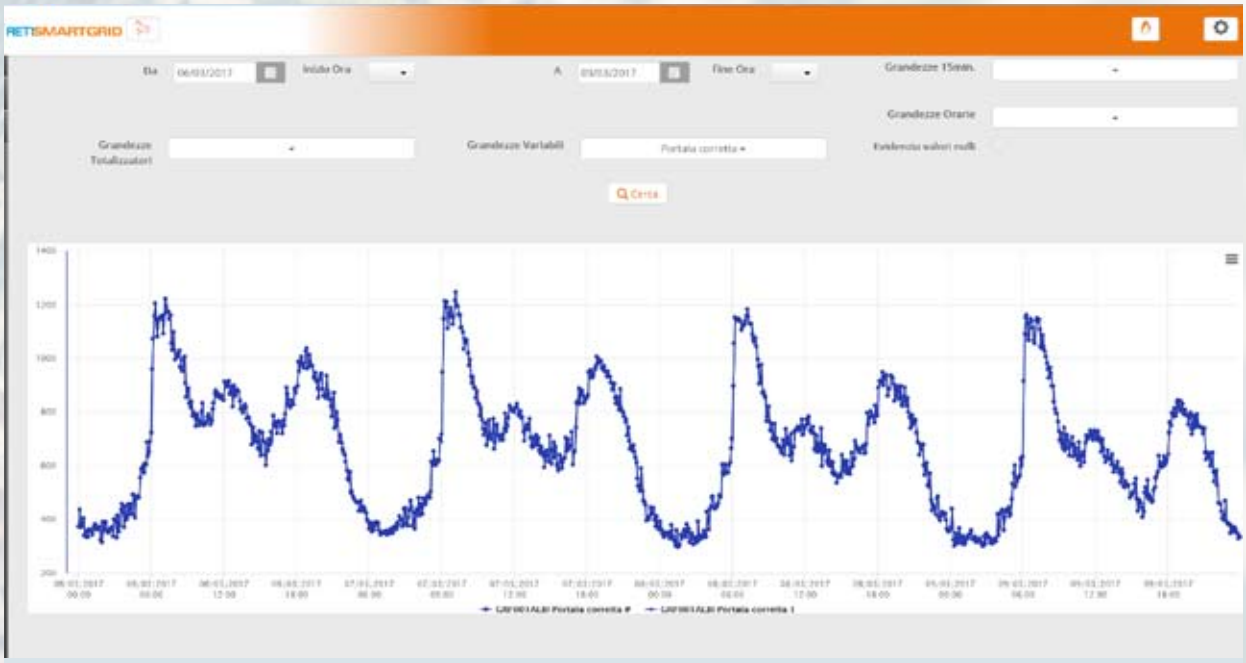


fig.4: over time flow chart detected downstream a PRMS

Now, if It technology can help us to see these variations and modify the pressure in the network depending on the load, ***there are many periods over the 24 hours***, especially at night, ***in which we can noticeably reduce the pressure on the network***. And as a consequence ***the number of leaks will also be reduced***.

Even if the saving shares, being calculated on a single city, appear to be minimum, it is clear that if the effect of this process was applied to larger areas (or even on the whole national territory) ***saving would be remarkable***.

The losses of a distribution network are calculated starting from the model developed by National Grid and validated by the University of New Castle according to such losses are related to the pressure with the formula:

$$Q=f(\sqrt{(\Delta p)})$$

Reliability of the model and ± 20% with confidence of 90%.

OUR TOOLS

The project is based on two fundamental elements:

The FIO device designed and realized by the Pietro Fiorentini Company, with the purpose of monitoring the pressur and flow trends in the distribution grid stations and autonomously implementing the variation of operating pressure as function of algorithms that can be remotely configured by the Control Center.

fig.5: FIO 2.0 device inside a PRMS

fig.6: Control Center software by Terranova

The Control Center, developed by Terranova Group, which through specially designed software allow to acquire from the FIO and other sensors, the salient measures of the network during exercise, predict critical conditions, act on the network by modifying the set-point regulators in the field with the dual purpose of ensuring the end-user service quality and reducing methane emissions.

RESULTS

The project was conducted in two phases:
In the first phase, lasting one year, by means the FIOs and data loggers located at the most critical network points, detected pressures and flow were by building a behavioral network data loggers and choosing which algorithms apply pressure modulation. Significant in this activity is the activity of the RetiPiù distributor.

fig.7: FIO 2.0 device inside a PRMS

In the second phase the pressure modulation was performed according to the selected algorithms, constantly monitoring the service quality and calculating the benefits in terms of leakage reduction

fig.8: pressure modulation examples

To reduce CO2 emissions, the use of sources of renewable and “zero emission” power supplies was also suggested, to power the devices where the electrical grid was not easily available. The project therefore included the design and realization of a power supply based on microturbine, that powered by the same gas, can generate enough energy to make the energy balance positive. In other situations, solar panels have been used.

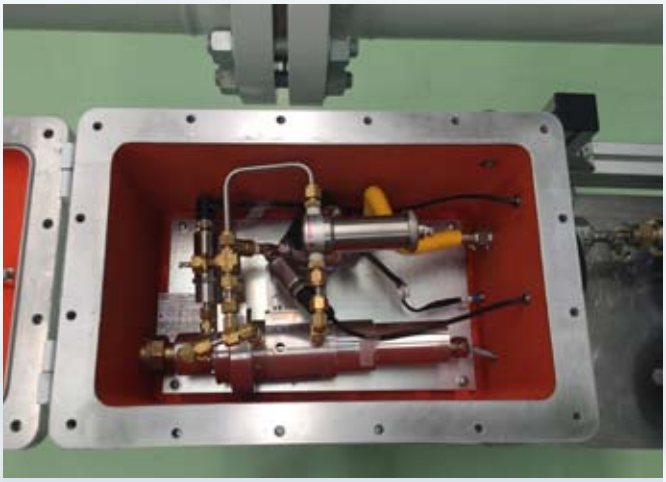
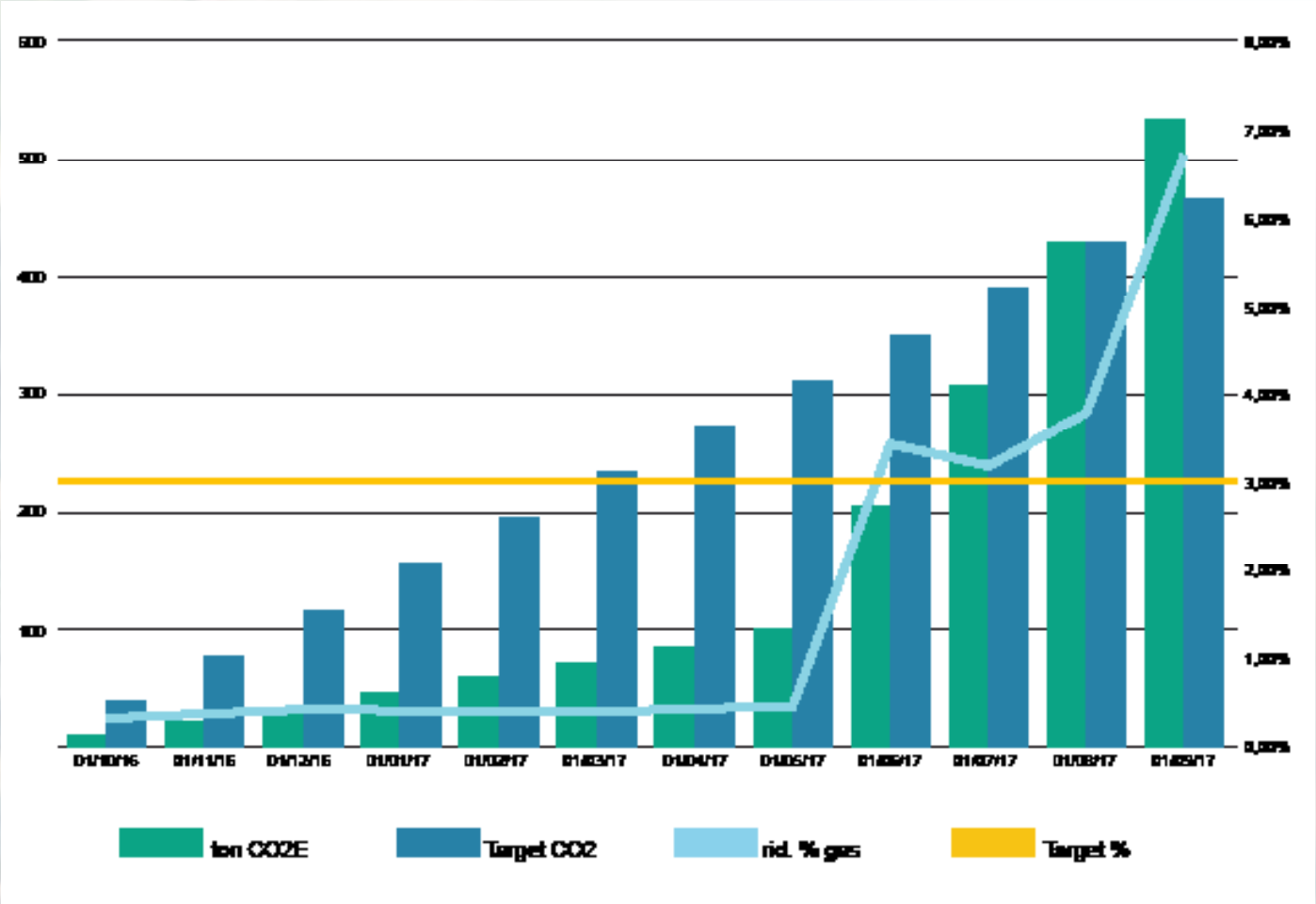


fig.9: micro-turbine detail

fig.10:solar panel providing power supply

PROJECT RESULTS

The results achieved during the 12 months of pressure modulation show that both project objectives are achieved: **the reduction of natural gas emissions is above 3% and the CO2 recovery is more than 470 TEQ**.



LOMG TERM ENVIRONMENTAL BENEFITS

Even though physiological losses in a gas distribution network are small, it is noteworthy that **methane is about 70 times more polluting than CO2**.

Even though it is a minimal quantity of gas per small network, it is clear that when multiplied over a larger area, or over an entire country, then the savings would be remarkable with two evident advantages: one environmental, because it would reduce greenhouse gas emission in the atmosphere; another economic, because even the client bills would go down.

The main benefits that can be obtained with the project are therefore:

- **Environmental Benefits**, resulting from the Reduction of CO2 Emissions
- **Economic Benefit** from loss reduction and possible “energetic efficiency certificates”

Whereas in Italy there is a network extension of about 100,000 Km with medium pressure, almost all in steel, and about 140,000 km in low pressure of which about 50% in steel (70,000 Km), the application of the FIO system with the same characteristics experienced in the context of the LIFE project, would bring, to Italian country, **a total benefit of more than 3 mega tonnes per year of CO2 not emitted**, which is a significant target (slightly less than 1%) compared to the overall reduction of 390 Megatonnels, due to Italy by 2030.

INFO ON THE PROJECT

COORDINATING BENEFICIARY:	Pietro Fiorentini
ASSOCIATED BENEFICIARY:	Terranova
	RetiPiù
PROJECT DURATION:	June 2014 - September 2017
TOTAL COST:	1.574.763 €
EU CONTRIBUTION	723.631 €
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