

NEW METER READING TECHNIQUES APPLIED TO THE BRAZILIAN GAS MARKET

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Abstract

This article will describe applications of the automation and automatic meter reading techniques at the internal gas pipes installations design, considering residential and commercial buildings, and taking in account the tendency of rapid growth of the activities related to the natural gas industry in Brazil, as well as the recently development of new technologies that can be applied with affordable prices.

It will be analysed the application of an automatic meter reading technology in a building of several floors in São Paulo, which gas installations design is being carried up, with be purpose of making a comparative cost-effectiveness study with the traditional constructive methods applied in Brazil. As a result, it will be purposed a new commercialisation model for the gas in Brazil at the residential and commercial market.

1. INTRODUCTION

Natural Gas industry at Brazil tends to roll good times. Several facts contribute for these optimist projections like the Brazil-Bolívia gas pipeline, the environment policies, the continue decline of the potential for the construction of hydropower plants at the industrialised parts of Brazil due to the fact that the best sites have been used, the new regulatory regimes, the privatisation of several companies, etc.

So, after decades and decades of disappointment periods, the Brazilian gas consumption has a tendency to increase very fast and as a consequence, this country provides an excellent scenario for introducing new technologies and challenges

The Bolivian gas will generate a considerable increase of the gas supply at the south part of Brazil and as a consequence, Gas distribution Companies will have to face the challenge of growing the gas demands at the some rate, in a very short time. Initially the will be priority will be the electrical generation plants (supplied by natural gas) and industrial consumers but the domestic gas market is

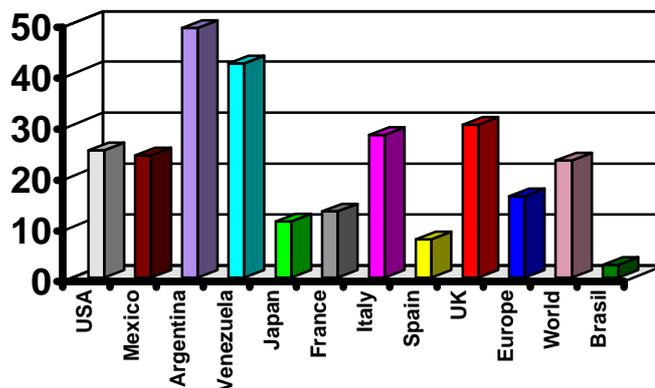


FIGURE 1 – NATURAL GAS CONSUMPTION - (BRAZIL x WORLD)

considered to be the most important one due to the necessity of reducing electricity consumption at the peak day time through the replacement of electrical showers for Gas water heaters as well as safety and economical reasons concerning the utilisation of the subsidised LPG. On the other hand, the domestic gas market do not seem to be attractive to the gas Distribution enterprises due to the fact that the amount of the residential gas consumption is very small as a consequence of the Brazilian weather as well as the non-existent culture about the canalised gas at Brazil. Gas, at the majority of the domestic consumers is only applied for cooking.

2. THE ACTUAL DOMESTIC GAS INSTALLATIONS SYSTEM AT BUILDINGS WITH SEVERAL FLOORS IN BRAZIL

Gas internal domestic installations at buildings with apartments constituted of several floors are made actually according to the following:

- The actual construction procedure requires one canalisation for each apartment due to the fact that the majority of the gas distribution enterprises don't permit the installation of indoor meters. (the reason of this requirement is related to the problems that will be originated to its employees to enter in the apartment when it is necessary to block the gas at consumers that fails on paying its bills);
- Meters are installed where the gas service enters the building , in a meter compartment;
- At the past, some gas distribution enterprises have tried to make a simplified installation system that was essentially made of vertical canalisation with horizontal derivations at the floors. In this case it was permitted to install only one meter (collective measurement) and the gas bill was sent to the administration of the buildings which shared it equally to the several apartments. In a very short time, they was obliged to give up on using this procedure due to many consumers complains about measurement problems.
- At São Paulo City, some old buildings which the old gas installations have been blocked due the occurrence of leakage's. This fact happened in several apartments when it took place the conversion from manufactured to natural gas, as a consequence of the internal pressure increase. These installations need to be remodelled in order to be commissioned again which is a very expensive job, considering the traditional construction systems.

During the years 1996 and 1997, some electricity companies at São Paulo State start to use remote metering systems. On these applications, the construction enterprise buys the system as a whole and installs the meters at the internal halls located at the several floors of the buildings. The electricity Distribution Company reads the meter through a notebook at the entrance of the building. The electricity companies carry out the maintenance of the system. It were mainly the construction enterprises that made the project goes ahead, due to the amount of money that they saved up on making only one busway instead of the traditional individual vertical single electrical installations as well as the fact the building would have one or two additional parking places (garages).

We tried to extend this idea to the gas domestic and commercial market. At this time we performed some preliminary cost-effectiveness analysis and it was clear for everybody that the application of an automatic meter reading system would only be possible on the following conditions:

- The meters should be installed indoors, at the internal laundries, close to the vertical gas canalisation. If the meters are installed at the internal halls of the floors, the installation may be more expensive than the traditional method, according to the architecture design. Gas pipes can't be put in the interior of concrete slabs, condition that doesn't occurs with electricity pipes, so the construction enterprise would never expensed a system on which the meters are installed at the internal halls.
- Gas Distribution enterprises would not invest money on an automatic meter reading system

for applications at the residential market due to the fact that the amount of consumption on this segment of market is very small.

3. THE PROPOSED NEW COMMERCIALISATION MODEL FOR GAS DISTRIBUTION COMPANIES APPLYING AUTOMATIC (REMOTE) METER READING SYSTEMS.

The purposed model has the following characteristics:

- Gas internal installations constituted of vertical canalisation (s) with horizontal derivations to the interior of the apartments.
- A single meter, installed by the Gas Distribution Company, where the gas service enters the building, in a meter compartment, will make the custody transfer measurement. (Large diaphragm or rotary meter). Only one gas bill will be generated and it will be sent to the building administration.
- Individual diaphragm meters with pulse generators incorporated, will be installed at all the individual laundry areas of the apartments. These meters will be connected to an automation system so that they can be read remotely at the entrance of the building through a PC and they will be used to share the single gas bill among the apartments so that it will be divided according to the rate of consumption of each apartment and incorporated to the administration bill.
- The individual meters, the wiring, the electrical installations, the PC, the software as well all the expenses related to the automation system as a whole will be sponsored by the constructor enterprise. The building administrator will carry the maintenance of the system (including the individual meters) up. Only the single meter to be used for billing the building will be expensed by Gas Distribution Company.
- Any technology may tested for this purpose since that, the amount of money that are saved up in the gas installations due to the economy of pipes and connections is minor than the cost of the system. Many facilities could be aggregated to the system like gas leak detectors, CO detectors, Fire security equipment, remotely controlled valves, etc. according the conception of "intelligent buildings".
- Many technologies may be tested like the Plc's, systems based on RS 485 serial communications, etc. There is a tendency of a migration of the industrial automation technologies to the building automation.

4. COST EFFECTIVENESS ANALYSIS

Now it will be described an exemplification of our project. It will be based on an architectural design of a Condominium with 15 floors, 8 apartments per floor, totalling 120 apartments. Gas, like the typical Brazilian residential installations, is in this case used only for cooking. We will carry out a cost-effectiveness analysis which take into consideration 2 scenarios: the tradition construction method typically applied in Brazil with 120 vertical canalisation's and the proposed technology which utilises remote meter reading techniques and only 4 vertical canalisation's.

The proposed remote meter reading system incorporates:

- Individual reading for the consumption of each apartment;
- remote digital shut-off valve planed to cut the gas supply in case of bad paying
- PC
- Energy back-up system for 20 minutes;
- Application software for monitoring the gas consumption as well emitting the shared invoices for the apartments ;

- Printer.

Figures 2,3 and 4 shows the gas installations of the entrance level floor, vertical canalisation and typical pavement of the condominium considering the tradition construction method typically applied in Brazil while figures 5, 6 and 7 illustrates the some construction with the application of the proposed e remote meter reading techniques:

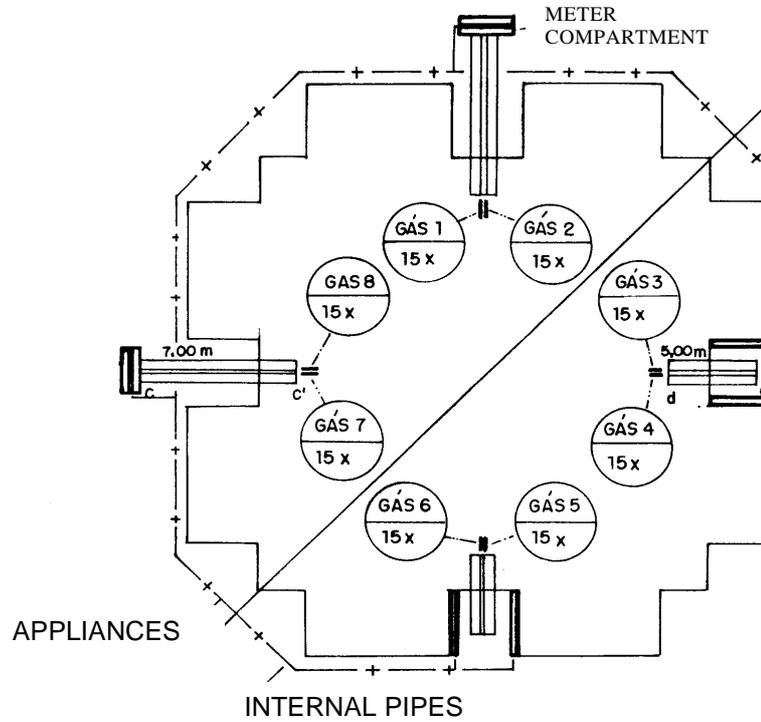


FIGURE 2 – TRADITIONAL SYSTEM – GAS INSTALLATIONS - ENTRANCE

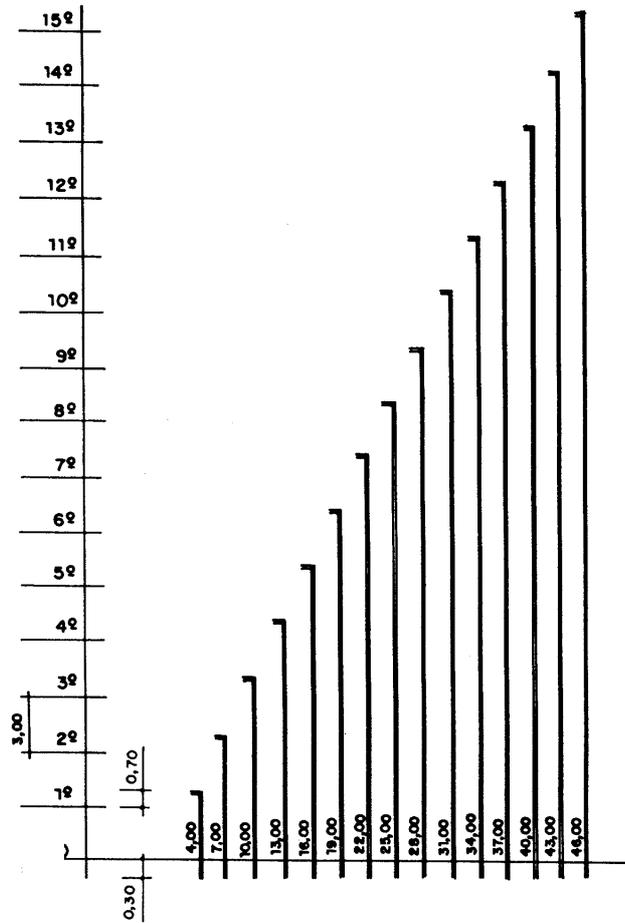


FIGURE 3 – VERTICAL PIPES (120)– TRADICIONAL INSTALATION

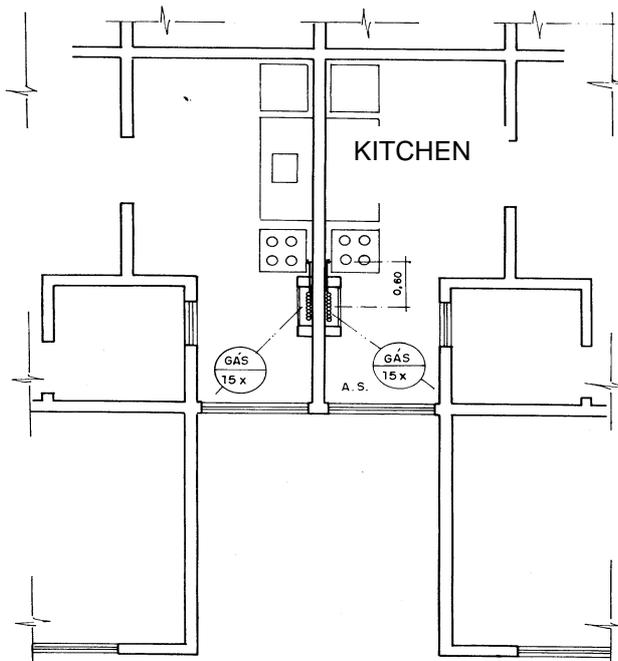


FIGURE 4 – TYPICAL PAVEMENT GAS INSTALATIONS – TRADICIONAL SYSTEM

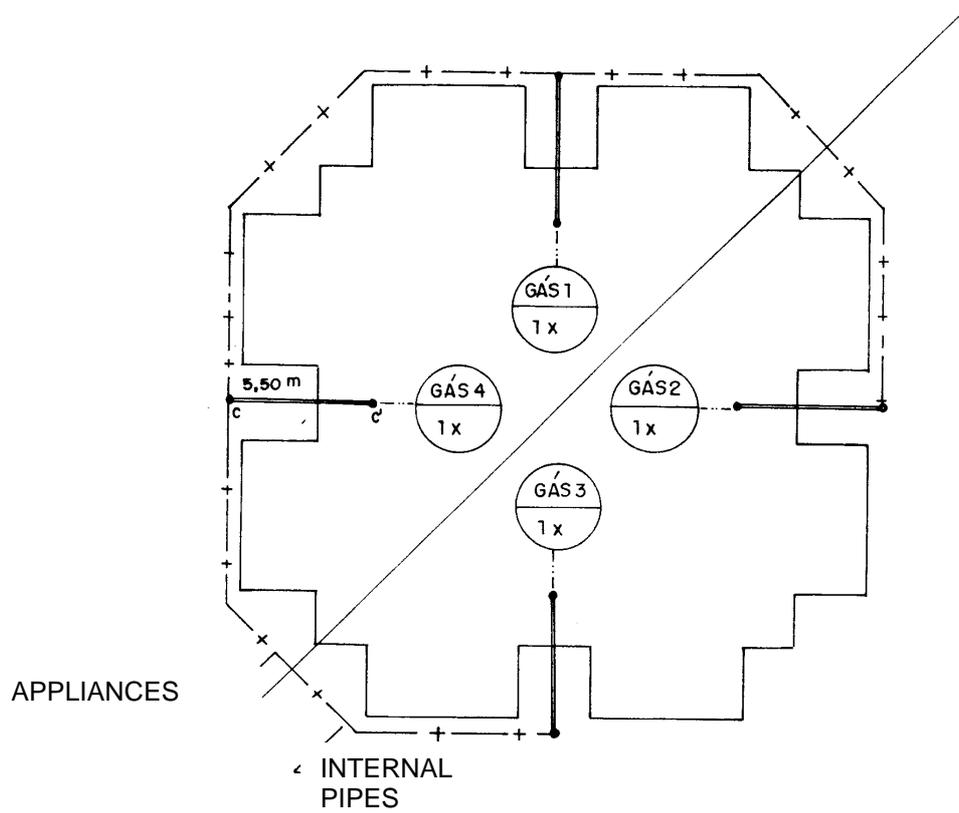


FIGURE 5 – ENTRANCE – INSTALLATIONS WITH REMOTE METRING SYSTEM

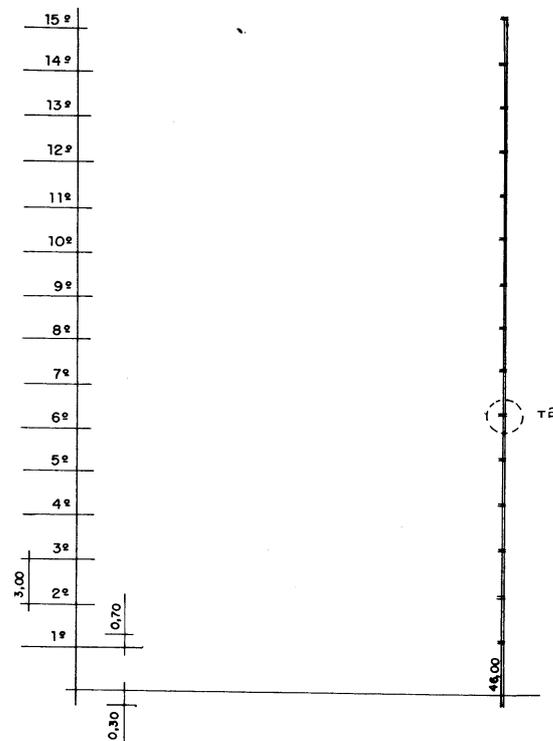


FIGURA 6 – VERTICAL CANALIZATIONS (4) – INSTALLATIONS WITH REMOTE METERING SYSTEM

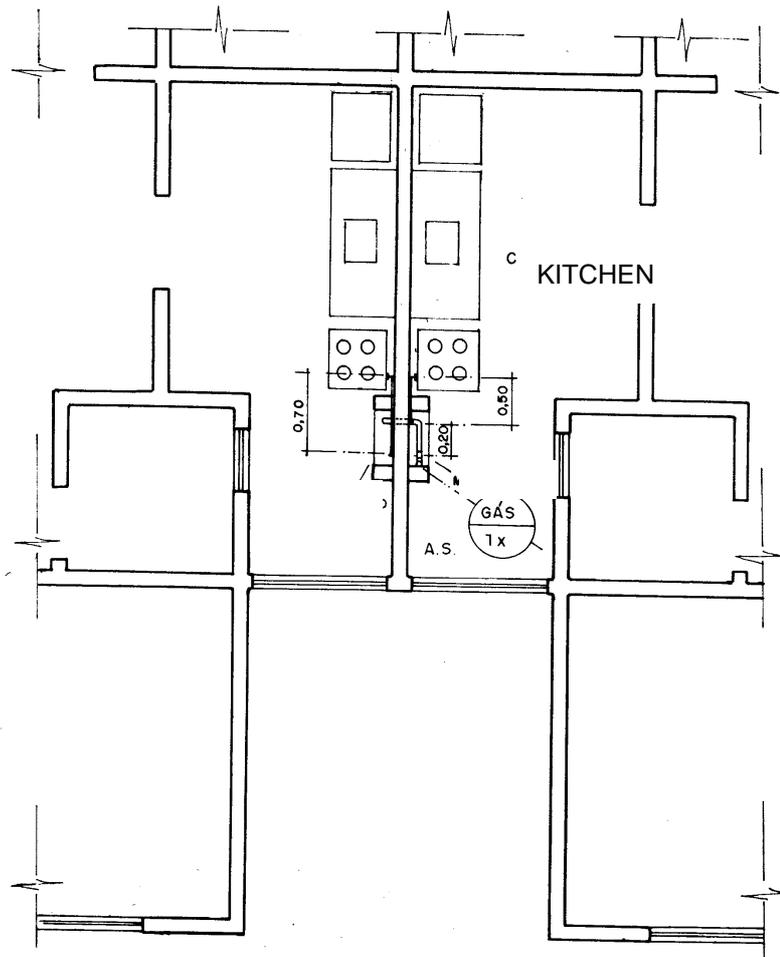


FIGURE 7 – TYPICAL PAVEMENT – INSTALLATIONS WITH REMOTE METERING SYSTEM

Table I illustrate an estimate of costs for the 2 described alternatives considering the some condominium:

EXTENTION OF THE CANALISATIONS	TRADICIONAL CONSTRUCTION			INSTALLATIONS WITH REMOTE METERING SYSTEM		
	ENTRANCE	VERTICAL PIPES	TYPICAL PAVEMENTS	ENTRANCE	VERTICAL PIPES	TYPICAL PAVEMENTS
	720m θ 3/4"	3.000m θ 3/4"	72 m θ 1/2"	22m θ 1 1/2"	184m θ 1 1/2"	144m θ 1/2"
CONSTRUTION COSTS	US\$ 41,000.00 (the overall condominium)			US\$27,000.00 the overall condominium)		

TABLE I – COSTS: TRADICIONAL CONSTRUCTION X INSTALLATIONS WITH REMOTE METERING SYSTEM

The estimate made for the remote metering reading systems includes wiring as well as the cost of 120 diaphragm meters

5. CONCLUSIONS

The implementation of this project will result on the following advantages for all the parts involved:

5.1 Gas consumers (canalized natural gas or LPG)

- Safety improvement ;
- Reduction of the maintenance costs.

5.2 Construction Enterprises

- Cost reduction;
- Implementation the conception of "intelligent buildings" with the aggregation at the system of several facilities like gas leak detectors, CO detectors, Fire security equipment, remotely controlled valves, etc. These facilities will valorise the construction and will facilitate as consequence the commercialisation of the building

5.3 Gas Distribution Companies

- Cost reduction with the acquisition of meters (US\$ 2,250.00 in the case of the mentioned building);
- Cost reduction related to the maintenance or replacement of meters;
- Cost reduction t related to the emission of (1bill instead of 120 bills);
- Bad payment reduction.