# INNOVATIVE TECHNOLOGIES USED IN THE SUSTAINABLE DEVELOPMENT OF NATURAL GAS DISTRIBUTION SYSTEMS

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***Abstract:*** *One of the major concerns of the companies in the field of natural gas distribution is the development of the natural gas distribution system, both by its extension in the areas covered by the concession contracts, respectively by the license, as well as by the concession of new distributions. The foundation of the plans for the sustainable development of the distribution system in the medium and long term is done taking into account the new innovative technologies in the field, as well as the use of modern computer applications that will ensure the efficient management of the distribution networks in accordance with the regulations of the National Regulatory Authority in Energy domain. Considering that natural gas plays a key role in the transition towards an economy based on reducing carbon emissions, representing clean energy, flexible and adapted to energy needs, one of the objectives of the activity in the field is the use of innovative technologies to increase performance. economic. The paper addresses the field and refers to the activities carried out by Distrigaz Sud.*

***Key words:*** *innovative technologies, sustenable development, gas, distribution systems.*
***Classification JEL:*** *O32, Q01, L95.*

## 1. Introduction

Concerns regarding the use of innovative technologies are part of the development strategy of the main actors in the field of natural gas distribution. The development of the natural gas distribution system is achieved by expanding the areas covered by the concession contracts, respectively by the license, as well as by the concession of new distributions. The elaboration, development and implementation of the plans for the sustainable development of the distribution system in the medium and long term is done starting from the existing facilities and taking into account the new innovative technologies in the field. The use of modern computer applications, specific to the field of activity, aims to ensure the efficient management of distribution networks in accordance with the regulations of the National Energy Regulatory Authority - ANRE.

The investments necessary for the development of the distribution systems concern both the expenses included in the concession contracts of the natural gas distribution service as an obligation of the concession operator, as well as funds for the development and implementation of new innovative technologies (Mușatescu, 2003).

Considering that natural gas plays a key role in the transition towards an economy based on reducing carbon emissions, representing clean energy, flexible and adapted to energy needs, one of the objectives of the activity in the field is the use of innovative technologies to increase performance.

The expected results as a result of the use of new technologies are aimed at increasing the security of natural gas supply by reducing the number and duration of temporary interruptions for emergency interventions and faulty remedies, increasing the flexibility of the natural gas distribution system in congestion situations, increasing the pressure at which it is distributed. natural gas to consumers and alignment of pressure parameters to European standards, reduction of technological losses due to the high degree of wear of existing steel pipes, reduction of operational costs and minimization of the negative impact on the environment by reducing gas emissions into the atmosphere.

Gas distributors are responsible for the sustainable development of gas distribution systems. Therefore, by implementing modern technologies, it is possible to ensure the maintenance and development of the system and the safe distribution of natural gas to consumers.

**2. General aspects regarding natural gas distribution systems**

At national level, the natural gas distribution system is regulated by the performance standard for the natural gas distribution and system service.

This standard applies in the relations between the operators of the natural gas distribution systems, which perform the activity of public service, and:

1. the users of the natural gas distribution system
2. the natural or legal persons addressed to the distribution operator for granting access to the natural gas distribution system
3. the natural or legal persons who address the distribution operator in order to connect to the natural gas distribution system
4. natural or legal persons requesting information or addressing complaints, complaints, requests regarding the distribution and natural gas system service
5. National Energy Regulatory Authority (ANRE).

The quality parameters in the field of natural gas distribution are regulated by ANRE through the Natural Gas Distribution Standard and are reflected in the following performance indicators (Chisăliţă, Albu, 2008).

1. recording and solving users' complaints, complaints and requests regarding the distribution and natural gas system service
2. contracting the natural gas distribution service
3. compliance with the conditions for surrendering and taking over natural gas
4. access to the natural gas distribution system
5. connection to the natural gas distribution system
6. restoration of the lands and / or assets affected by the execution of works to the objectives of the natural gas distribution system
7. limitation / interruption of the supply of the distribution and system service of natural gas

The essential characteristics of the system are defined by the National Energy Regulatory Authority - ANRE, by the regulation on access to natural gas distribution systems from 25.05.2018.

This regulation regulates the access conditions of the applicants / users to the natural gas distribution systems (SD) and completes the performance standard for the natural gas distribution and system service.

The characteristics of the system are:

a) the entry points into the distribution system (SD) are:

- the points located downstream of the taps at the exit of the manufacturer's regulation-measurement-delivery station;
- the points located downstream from the exit of the regulation-measuring-teaching station of the transport operator;

b) the interconnection points between the distribution systems are the points at the exit from the regulating-measuring station of an SD located upstream;

c) the exit points from the SD are the points located at the exit of the stations / adjusting / measuring stations or, as the case may be, the exit from the connection faucet to the installations for the use of the final customers.

The main strategic directions of the companies in the field are represented by the development and modernization of the distribution network. The main objectives pursued by companies through their investment programs are:

- connecting to the existing infrastructure of new communities, clients or economic agents;
- The modernization of the network by replacing the natural gas pipes that have a long-term operating life.

The main objectives that coordinate and materialize the activities in the field are:

- creation and development of public gas distribution services
- supporting investment initiatives in the production field by reducing the costs of energy consumed in various technological processes;
- stimulating productivity, modernizing and increasing the competitiveness of enterprises and other industrial and commercial structures
- Environment protection.

In order to achieve these goals, all companies in the field must act in the following directions:

- continuous improvement of the integrated management system of quality, environment and occupational health and safety
- use of automated equipment that gives the possibility to adjust the operating parameters of the remote distribution system and to increase the degree of security regarding its use;
- the use of equipment complying with European Union standards regarding quality and safety in operation;
- collecting the most accurate data from the field, referring to both individuals and industrial companies, in order to optimize the distribution and distribution systems.

**3. Development of natural gas distribution systems by Distrigaz Sud Networks**

At national level, the development of natural gas distribution systems is carried out in two directions:

- Extension of existing distribution systems in areas where there is a concession contract and operating license;
- New gas concessions by expanding the concession area or by setting up new natural gas distribution systems, concurrently with the concession of the public gas distribution service.
- The extension of the existing distribution systems in the concession area starts at the request of connection to the distribution system of the clients, for this purpose a technical-economic study is carried out according to the procedure of elaborating the technical-economic study in order to achieve the objectives of the gas sector natural gas approved by the Order of the President of the National Energy Regulatory Authority no. 104 / 2015. This study evaluates the technical and financial conditions for achieving the elements necessary for connecting the applicants to the natural gas distribution system.
- By derogation from the provisions of Order 104/2015, in the situation where from the technical-economic study it appears that the financing deficit rate is less than or equal to 20%, the distribution operator fully bears the investment costs.
- For the period 2019-2023, it is estimated that approximately 350 km of pipelines will be built with financing from both own funds and with funding from applicants.
- Analyzing the increase of the number of delivery points (PDL) by 12,950 compared to the end of last year, as well as the increase of the density of customers on the network in March 2019 to 91 PDL / Km compared to 89 PDL / Km in the same period of the previous year, for the period 2019-2023 is estimated to install about 60,000 measurement devices / year to new customers.

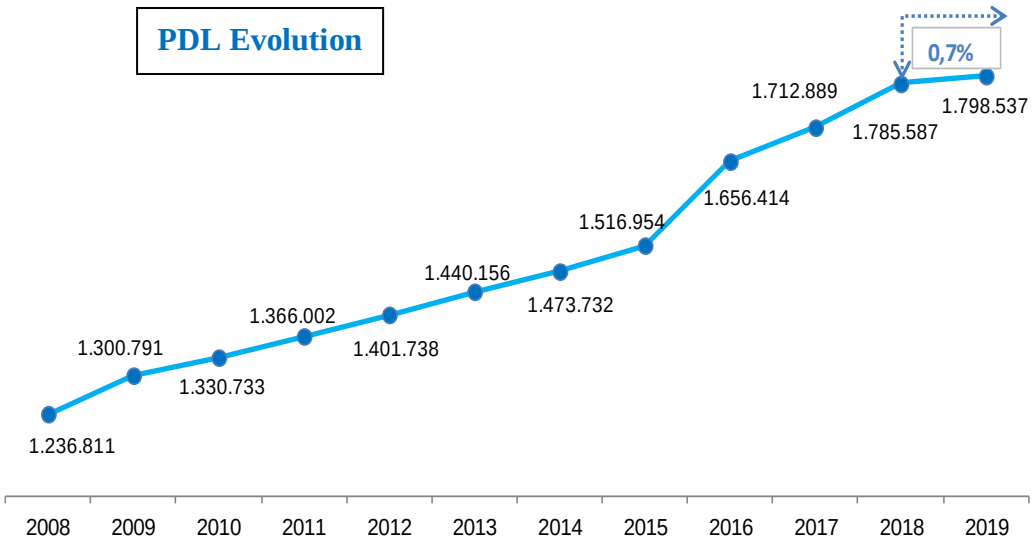


**Figure no. 1.** Evolution of the number of delivery points (PDL)
Source: Processing after https://www.distrigazsud-retele.ro/

**4. Opportunity to use innovative technologies**

Concerns regarding the use of innovative technologies are part of the development strategy of the main actors in the field of natural gas distribution. In this sense Distrigaz Sud Networks pay special attention to the activities that require interventions on the distribution network.

As an example, when a newly developed neighborhood needs to be supplied with natural gas or a pipeline needs to be replaced, the gas supply in that area should be stopped for the execution of the work. The innovative method used by Distrigaz Sud Networks, is based on the intervention with balloons and special equipment under gas pressure.

The technique is a know-how taken from the Engie Group, Distrigaz Sud Networks being the only company in Romania that uses it.

At the moment when the intervention is carried out on a large industrial consumer or when it is a whole residential area, any cessation of the natural gas supply can cause disturbances in their activity. Because balloon intervention implies continuity in feeding, these drawbacks are eliminated.

The technique involves establishing the area for which the intervention is required, computer simulation of the work in order to check the gas pressure and to identify the stations connected with the respective gas pipes, to perform the discovery, to identify the defect and to perform the by-pass. As the name suggests, the method is to make an alternate gas circuit through a special hose, during which the faulty pipe is fixed or replaced.

For the intervention, upstream and downstream of the defective pipe, there are two holes in which two special devices will be introduced. The first will be used for deflecting the gas, and the second for filling the pipeline by introducing balloons. During this entire execution interval, significantly reduced, the pressure is permanently monitored and diminished, if any.

This innovative technique has a major impact on the quality of the works performed by Distrigaz Sud Networks, but also on the satisfaction of the directly involved consumers.

The development on innovative principles of technologies in the field of natural gas distribution was the basic theme of the European meeting that took place between May 28

and 29, 2019 in Brasov. The European Association GD4S (Gas Distributors for Sustainability), has approached a topical theme with the title "Innovative Gas Solution for Municipalities". On this occasion, European funding programs were identified for municipalities to support the development of natural gas infrastructure, smart solutions in terms of energy efficiency and urban mobility.

The GD4S (Gas Distributors for Sustainability) association is founded by the DGSR together with GRDF (France), Nedgia (Spain), Galp Gás Natural Distribuiçao (Portugal) and Italgas (Italy) with the aim of promoting natural gas as the main resource in the Union European energy transition.

During the meetings generated by GD4S, it is stressed the importance of supporting the European authorities to increase the consumption of natural gas by expanding and modernizing distribution networks, stimulating urban mobility (based on GNCV technology), ensuring the security of gas supply in the European Union by enhancing deposits of the Black Sea.

**5. Computer applications used in the activity Distrigaz Sud Networks**

From the perspective of information technology, within Distrigaz Sud Networks has been implemented over time an integrated computer system that ensures the acquisition, processing, storage, history, consistency and security of the data, in order to manage the activities and the operational processes and to provide services. quality, respecting the quality standards and the norms in force.

By implementing the integrated IT system, both the degree of access to the information relevant for substantiating within the organization the short, medium and long term decisions and the degree of technical-economic efficiency for the activities carried out by the company has been improved.

The architecture of the computer system currently comprises Software Applications, integration components, computing hardware and communications equipment and solutions to ensure data availability, security, compliance and confidentiality.

The management of resources within the company is carried out in the core system SAP ERP (Enterprise Resource Planning), respectively the IS-U solution specific to the domain of utilities.

List of modules used and their description within the SAP system:

- FI & CO for the management of financial-accounting and controlling activities
- SD for the management of sales and invoicing activities
- HR personnel management and payroll
- PM planning maintenance operational activity
- MM materials management
- PS management of investment projects
- WF management of workflows and automations within the system
- OP the integration component between systems
- BW Business Warehouse reporting component

The planning of resources (human, service providers, work equipment, materials, uses, and cars) associated with preventive, corrective maintenance activities (including emergency interventions), technical clientele (disconnection, reconnection, replacement of meters, commissioning) is carried out through the ABB Service Suite IT workforce planning application. By integration with the SAP system, the application allows the dispatching of work orders on mobile terminals to field technicians for execution (~ 800 mobile terminals). This ensures the following operational benefits:

- optimizing the planning process, streamlining resource management and increasing productivity;
- monitoring and traceability of activities;
- reducing the risks of industrial security, by allocating the appropriate competences in the operational activities;
- ensuring optimal response time for emergency interventions;
- increasing customer satisfaction through efficient scheduling of activities;
- Predictability by obtaining an efficient reporting tool.

**6. Conclusion**

Natural gas is one of Romania's main sources of primary energy. They have a wide use in the economic life, being an energy source used in all fields of activity.

Romania has the largest market for natural gas in Central Europe and was the first country to use natural gas for industrial purposes.

Companies in the field of natural gas distribution and in particular Distrigaz Sud Networks implement innovative integrated information systems that have the role of ensuring the acquisition, processing, storage, history, consistency and security of the data, in order to manage the operational activities and processes and to provide quality services to customers, respecting the quality standards and norms in force.

Following the study, the opportunity to maintain and continuously improve the technologies used is highlighted. In this way, both the degree of access to information relevant to the substantiation within the organization of short, medium and long term decisions and the degree of technical-economic efficiency for the activities carried out by the company increases.

In accordance with the provisions of the integrated management system, the systematic audit of the activity of the companies, can lead to the fulfillment of the conditions of satisfying the demands of the consumers.

Anticipating the evolution and development plan of the Distrigaz Sud Networks activity, the obligation to maintain an adequate level of quality and exploitation within the integrated computer system, the technological progress and technological progress of the aforementioned computer applications is absolutely necessary to make investments aimed at extending the functionalities and the existing capacity, digitization of processes and customer interaction, technical and functional upgrade of applications as well as periodic replacement of physically and morally used equipment.

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