

Dan Paul Ștefănescu*, Valentin Petrescu**

**NATURAL GAS COMPANIES' TRENDS AND PERSPECTIVES
IN PRODUCTION, STORAGE
AND CONSUMPTION OF NATURAL GAS**

1. THE ROMANIAN GAS INDUSTRY TRADITION

The history of natural gas exploitation has an important role in the Romanian economical evolution. 100 years of gas activity represents a period when the event from the beginning of the last century, that of discovering the natural gas in Transylvania, subsequently changed in an important economical segment with a infrastructure of considerable dimensions.

- 22nd of April 1909 was the first existential reference point, the natural gas discovery in Transylvanian Basin, through well no. 2 Sărmășel. This well had as target the potassium salts discovery, but three violent natural gas eruptions, at 160, 228 and 302 m height gave another valence to the initial step. The gas flow rate of the well was estimated as being of about 900 thousands stmc/day. This well is positioned on the fourth place in the world at that moment, from the registering flow rate point of view. It was found that the discovered hydrocarbons were 99% methane composition. Because the casing was not cemented, the well couldn't be closed, so this had been a reason to let it in blow out until 23rd of June 1910, when a Christmas tree was installed. The well was re-completed accordingly to the technology evolution and it had produced until January 1993. The total gas cumulative was 1,5 mld.Stcm.
- 1914 is also an emblematic year for the gas industry. This is the period when the first natural gas transportation pipeline was built in the European Continent from Sărmășel to Turda, with a length of 55 km and a diameter of 153 mm.
- 1925 brings another premiere at the continental level: the building of first natural gas regulating metering delivery station from Europe in Mediaș.

* SNGN ROMGAZ SA, Mediaș

** Lucian Blaga University, Sibiu

- 1927 is the year when it was built, at Sărmășel, the first natural gas compression station from Europe. This is another reference point of a major importance to the Romanian natural gas industry evolution.
- 1958 brings a new approach to this field, the first underground gas storage from Europe was set in the Transylvania Basin, at Ilimbav, for taking over the seasonal consumption peaks.

2. THE EUROPEAN GAS MARKET

The Romanian tradition of the natural gas industry, the achievements in this area, during one century are of high importance. Although they entered later in the energetic balance, the gas occupied at the moment the second place, with 23% in the European level, after petrol, Romania taking almost 36%. On a medium and long term, the natural gas will take an important place in the primary energetic balance, and its economic role, probably will be increased also due to the fact that they could be valued almost completely. The transmission through the pipelines it is easier on long distances, and the utilization and exploitation costs are lower than for the oil and coal.

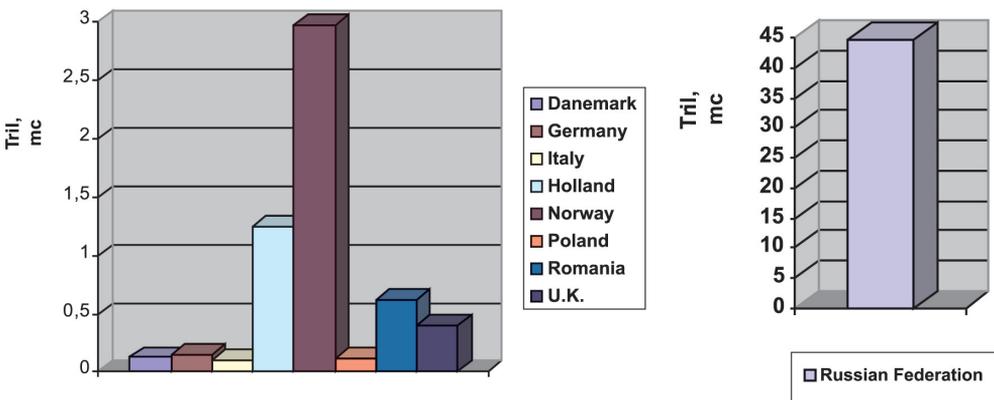


Fig. 1. The proven natural gas reserves at European level – 2007

A statistics at the continental level in what concerns the proven natural gas reserves (Fig. 1 – the proven natural gas reserves at European level – 2007) and the internal consumption of the European states (Fig. 2 – the internal European gas consumption) indicates an accentuated difference between the two components. The increase of continuous demand on the energy market is a reality which generates an accentuated dependence of the imported hydrocarbons at European level, being estimated to 70% in 2003.

The high demand increases, the irreversible reserves decrease, the impacts and the emergencies which appear in the gas supply, are good reasons of worry in the European level. In this context, also the Romanian companies from this field try to outline an energetic politic connected to the European reality.

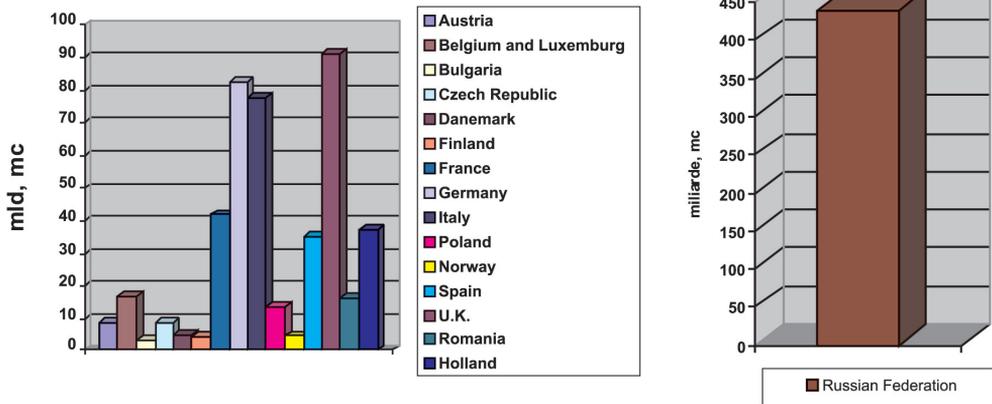


Fig. 2. The internal European gas consumption

3. TRENDS AND PERSPECTIVES

3.1. The underground gas storage

In the context of an annual irreversible production decline and of the relative serious aspects that are generated by the perturbation on the gas market, Romgaz considers that one of the variants is the underground gas storage.

Romania has an important development potential of the underground gas storage capacities that can satisfy the internal necessities. But, in the new European context, the underground gas storage role changed – it increases the deposits role for the optimization of the natural gas prices, as a commercial and strategic instrument.

The underground gas storages shouldn't be considered an independent natural gas source; they represent just an instrument for an efficient administration of the available sources on different periods of a year.

According to the strategy of development, Romgaz considers that the increase of the underground storage capacity is a real opportunity. Either it is about the modernization of some new underground natural gas storages, or of the increase in capacity of the existent ones, this is a solution which must be carried out really fast enough.

Lately the storage capacity had an ascendant trend, so that in 2008, at the end of the injection cycle, Romgaz stored in its underground deposits, approximately 3000 mil. mc gas, that means 16–17% from the annual gas demand in Romania. Comparing this value with what happen in the European States, we will find out that in their cases, the security degree for supplying natural gas consumers from the underground gas storages, reaches values with more than 25%. Starting from this premise, the Romgaz strategy spreads out on two main coordinates: the intensification of the existent development capacities and the development of some new deposits in areas which are registered as problematical in natural gas supplying in security conditions.

Romgaz operates six underground natural gas deposits of its own, located:

- 2 in the Transylvanian Basin
- 4 in the extra Carpathian area and
- 2 deposits in association with other companies.

After an analysis between the Romgaz reservoir production capacity in the cold and warm period during more years, the conclusion was reached – because almost all reservoirs are mature and exploited optimum at lower pressures, in the context of some high pressure values in the national transmission system during the warm period of year, the reservoirs does not function at their optimum production capacity.

According to this aspects, maintaining a lower pressure during the warm period of the year by installing some compressors in the field, could be possible for this reservoirs to work at their maximum capacity with the possibility that the overflow unused on the market to be injected in regional technological underground gas storages.

The gas demand in the Romanian energy market is characterized by:

- seasonal fluctuations of about 60%;
- daily fluctuations of about 25%;
- hourly fluctuations that could reach approximately 30%.

These fluctuations are mainly due to the domestic consumers (population, hospitals, schools etc.) and to the industrial consumption (thermal power stations and regional thermal plants). As it can be noted, the differences in gas demand are significant, with a negative impact both reservoir exploitation and transmission and distribution systems.

For these reasons, the development of natural gas storage capacities for taking over the consumptions peaks during the cold season, as well as for increasing the natural gas supply security in time crisis represents one of the important aspects of the Romanian energy strategy.

New gas storages are proposed to be build in half-depleted reservoirs ideally located near areas with supply difficulties. The locations of these new gas storages will be selected based on the connection of the national transmission system to the selected depleted reservoirs.

3.2. Rehabilitation of mature natural gas reservoirs

Undoubtedly, the concerns of natural gas production specialist to maintain a high production level were continuous, but modern and sustained trends and strategies emerged rather recently. This is also due to the fact that following the changes in the Romanian society after the 90s there was the possibility to access international state of the art techniques and technologies which shaped a new vision and a different approach of this matter. It was under these circumstances that the concept of natural gas production rehabilitation emerged and the efforts to apply such concept increase continuously.

The rehabilitation of natural gas production means a set of strategies and a series of sustained actions supported by an adequate management of the production process, the purpose of which is to bring back and to maintain a gas structure or a gas formation at its potential parameters.

Figure 3 illustrates a qualitative graphical representation of the above mentioned; the shape of the curve representing the forecasted rehabilitated production which depends on numerous factors out of which the most important ones are the physical and hydrodynamic parameters of the porous environment in which natural gas is trapped. On the other hand, the curve representing the rehabilitated production is the result of cumulative effects resulting from the performance of some operations and/or the implementation of some specific technologies aimed at increasing natural gas production. The shape of the curve is specific to each reservoir or formation depending on the results achieved further to the application of different rehabilitation methods and procedures.

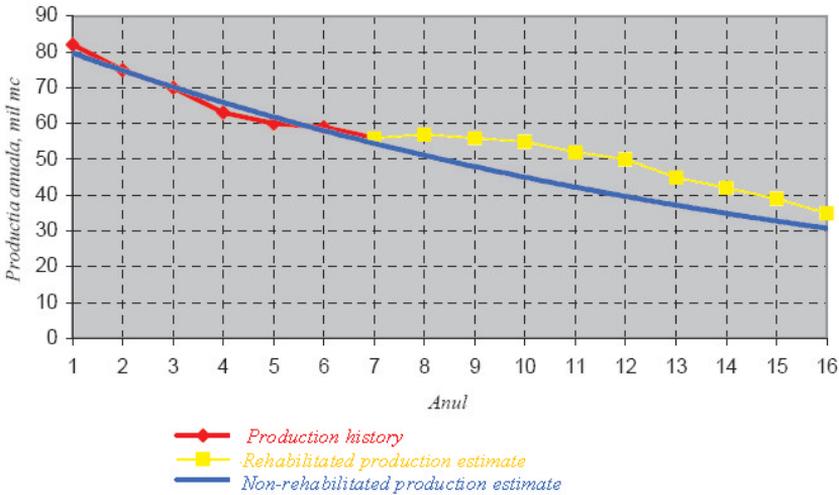


Fig. 3. Qualitative representation of the result of production rehabilitation in a gas structure

A statistical analysis on the achieved recovery percentages and on the current geological resources of the natural gas reservoirs put into production within the Transylvanian Basin, shows significant differences between the total volumes produced and the initial geological resources. This finding points to the fact that a great number of these reservoirs could become potential candidates for rehabilitation.

According to the aspects targeted by the use of a production rehabilitation method, there are:

- methods of modifying certain physical parameters of the reservoir: acid job, fracturing;
- methods of sand control in wells producing from poorly consolidated formations: gravel pack and frac-pack;
- methods of bottom hole water removal: plunger-lift, foams, gas-lifting;
- methods of improving the communication between the layer and the well bore: re-perforations, additions, horizontal drillings, completion fluids in gas saturated reservoirs which do not affect their flowing properties;
- methods of reducing the back-pressure at the Christmas Tree: commencement of the compression process at the formation level or at the Christmas Tree, resizing of the gas compression process.

3.3. Liquefied Natural Gas

Based on the experience of the European Union countries it was established that underground storage and LNG are two connected activities that ensure security of supply and peak shaving. Currently, LNG is an increasingly attractive source as indicated by the interest of many countries to develop collaborations with the producing states.

The European LNG market is continuously growing. The following are among the “richest” countries with LNG terminals: Spain – 5 terminals, France, UK – 3 terminals, Italy, Portugal – 1 terminal. Lately, natural gas liquefaction and shipping developed quickly because it is the only solution which ensures a great flexibility in terms of gas supply sources – the supplier can be easily changed and can be located at great distance.

Romania tried to identify the countries with LNG potential and to create partnerships between the specialized Romanian companies and the local ones.

In this way, S.N.G.N. Romgaz S.A. and USTDA signed an agreement according to which a grant was awarded to the most important gas producer in Romania. In exchange, Romgaz undertook to perform a feasibility study for a LNG terminal on the Black Sea coast, in Port Constanta. The project aims at satisfying the strategic, geopolitical and economical needs of Romania with respect to the country’s increase of energy security as well as at fulfilling the requirements to bring in Romania available gas from international markets without building an expensive international infrastructure. Initiating a LNG import terminal project was taken into consideration due to the continuous increase of long term gas demand against the background of economic growth in Romania and in the region.

We cannot speak of a target consumer for this type of product and we cannot expect it to have a big share in the domestic consumption. There is the possibility to liquefy, for shipping, the gas in the producing and supplying countries and then to re-gasify, which will ensure its direct use through injection in the National Transmission System.

4. CONCLUSIONS

The new attempts to create a single European market through a competitive and sustainable energy policy could only result in a partnership, solutions and projects drawn up with the neighboring countries.

The philosophy of the new policy in the field of natural gas, actually implies a better use of the domestic European energy market as well as diversification of the supply sources.

The complexity of the issues faced by the gas industry increases as the number of players involved -suppliers, producers or regulators- increases and as the issues concerning meeting the demand become crucial. The progresses related to the continuous increase in the dependency on gas imports and the implications on the security of supply and, on the long term, on the consumption and development, are challenges that Romania must face.

The biggest producer of natural gas in Romania, S.N.G.N. Romgaz S.A., connects to this reality. For this purpose, Romgaz investment budget increased during the past years. Starting from the idea of a permanent competitive development opportunity, Romgaz sets as its main goal to support the gas production by means of discovering new resources and to put new wells into production, to rehabilitate mature gas reservoirs, to develop underground gas storage capacities, to improve the gas quality and the metering and control systems, to

retro-fit, upgrade and increase the exploitation security of the existing production capacities, to protect the environment and, last but not least, to provide independent equipment and high-performance facilities, necessary to support the main activity.

REFERENCES

- [1] Stefanescu D.P., Foidas I.: *Considerations on the applicability of the concept of natural gas production rehabilitation in gas structures within the Transylvanian Basin*. Scientific Notebook, Oil – Gas University, Ploiesti, 35 Years of Activity, 2002
- [2] Piteiu M., Rotar D., Sutoiu Fl., Simescu B.: *Natural gas storage*. A production optimization solution for S.N.G.N. Romgaz S.A. Medias Branch, – Foren 2008 Romania
- [3] *** S.N.G.N. Romgaz S.A. studies and analyses