



Analysis of Structure and Dynamics of Natural Gas Industrial Consumption

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Introduction

In the last dozens of years, the role and importance of natural gas in the energy balance of the global economy has been continuously growing, which is conditioned by its high efficiency as an energy resource and raw material for industry, and higher environmental friendliness compared to that of oil and coal. This trend will continue in future, or, perhaps, it will even strengthen due to cheapening of natural gas liquefaction technologies and new main gas pipelines construction.

In this paper, data collection, analysis and generalisation of information on industrial sector natural gas consumption in the countries of the world have been performed. In addition, information on the total natural gas consumption by regions of the world, and analysis of the structure and dynamics of natural gas consumption for 5 years is provided below.

Besides, a comparison of the structure and dynamics of natural gas consumption in various countries has been made, including the influence of economical, technological and other factors.

The structure of natural gas consumption has been analysed with respect to the following regions of the world:

- North America
- Latin America & Caribbean
- Europe
- Africa
- Middle-East
- CIS (including Russia)
- Asia
- Asia Pacific

According to the OECD preliminary data, gas consumption in the industrialised countries increased by 5.5% on the average as at the end of 2010, and in Europe the growth was 7%, in North America and Asia natural gas consumption increased by 3.4%, and 10.7%, accordingly. The statistics shows that natural gas is rapidly strengthening its position in all markets, and that is not surprising since this is the most ecologically clean type of fuel.

Objectives

- To provide information on the total natural gas consumption by regions of the world;
- To generalise and analyse information on natural gas consumption by the industrial sector in the countries of the world;
- To compare the structure and dynamics of natural gas consumption in various countries, considering influence of economic, technological and other factors;
- To define the principal trends of use of natural gas for the long-term perspective;
- To evaluate prospects of use of natural gas by the industrial sector in the countries of the world; and
- To identify basic activities aimed at improvement of efficiency of industrial gas use.

Methods

- Processing of statistical information of the Enerdata-base and periodicals;
- Application of system analysis method;

- Tabulation, comparison, computational and analytical methods, as well as method of scientific generalization;
- Comparative analysis.

Results

For the last 20 years, the share of natural gas in the global energy balance has increased from 19 to 24%. According to some expert's forecast, it will continue to be growing gradually up to 26–28% by 2020 and up to 30-35% by 2050.

The scale and structure of consumption of energy resources in the global economy have been changing in time under the influence of demand and supply.

According to the statistics, the global natural gas consumption grew by 6.2% for the period from 2005 to 2009 (Table 1). The global economy growth is the main factor for the increase in the natural gas consumption, which causes the growth of the global industrial production, on the one hand, and consumer preferences and purchasing power of the population, on the other.

Table 1 - Natural gas consumption by industrial sector and by the entire world

	2005	2006	2007	2008	2009
World (Industry), mcm	2,871.8	2,937.2	3,072.1	3,148.5	3,052.5
World, mcm	671.3	697.8	721.1	728.1	695.1

Similar to the situation with the world's natural gas consumption from 2005 to 2008, industrial sector natural gas consumption also increased (from 671.3 bcm to 728.1 bcm). In 2009, there was a decline in industrial sector natural gas consumption due to the financial and economic crisis. The natural gas consumption decreased by 4.5 % down to 695.1 bcm. Generally, the industrial natural gas consumption increased by 3.5% up to 23.8 bcm from 2005 to 2009 (Fig. 2).

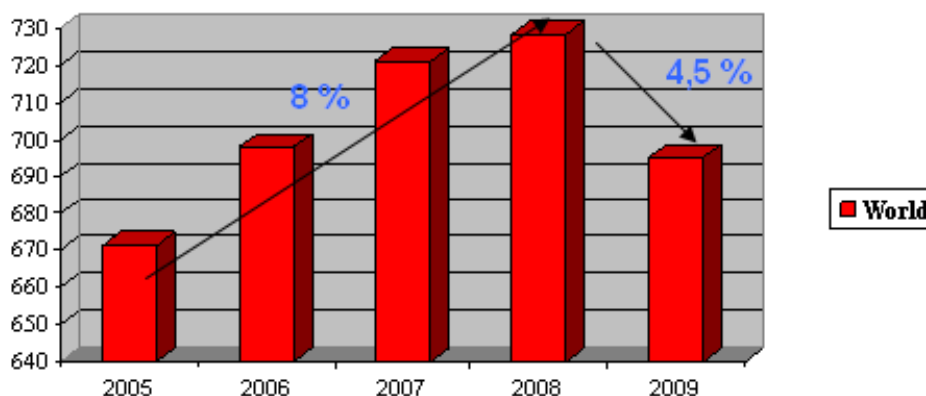


Fig. 2 - Dynamics of industrial sector natural gas consumption in the world, bcm

Among the determining factors of demand for natural gas are development rates of the global economy and its energy-intensive sectors, such as electrical energy industry, chemical industry, iron and steel industry and some other industries. Consumption by the service sector, social and household sectors also influence demand. In these economic sectors, multidirectional influence of many factors can be seen. On the one had, new energy saving technologies and products that appear in the market reduce demand for natural gas, and on the other hand, the increase of energy power available for the service sector, social and household sectors leads to its growth.

Distribution of natural gas consumption by regions of the world is as follows:

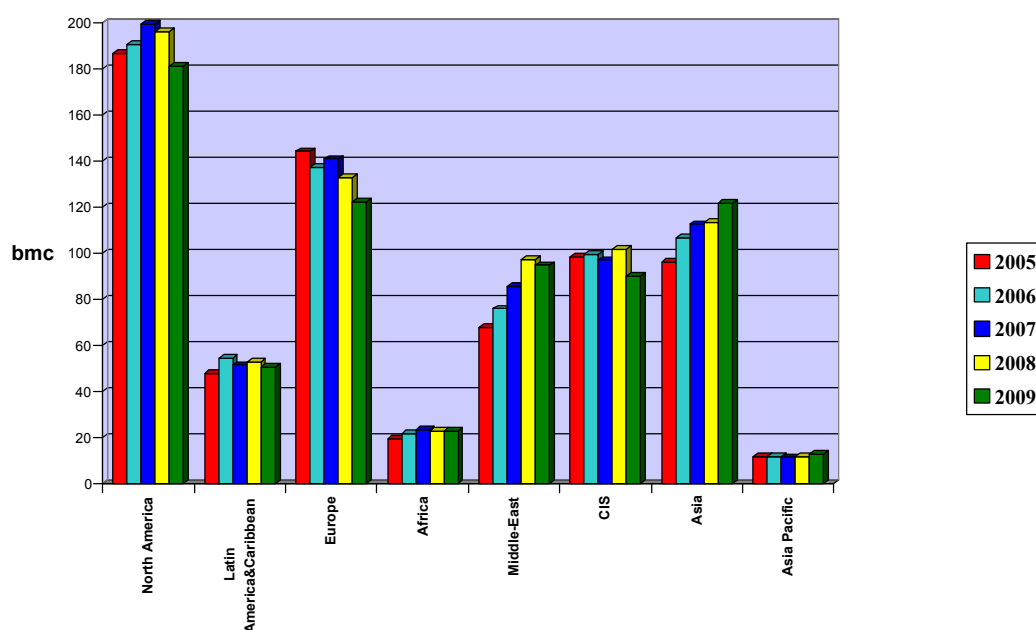


Fig. 3 - Industrial sector natural gas consumption by the regions of the world

Analysis of the provided information enables to note that for some years now, North America has been the world's leader in the industrial sector natural gas consumption (around 30% of the world's total industrial sector natural gas consumption), despite the fact that for the last years, since 2007 this region has been tending to reduction in natural gas consumption (from 199.6 bcm to 180.8 bcm).

The second position in terms of industrial sector natural gas consumption belongs to Europe (some 20% of the world's total industrial sector natural gas consumption). However, based upon the dynamics from 2005 to 2009, this region tends to significant reduction of industrial natural gas consumption. The natural gas consumption in this region reduced from 144.1 bcm to 122.1 bcm, and thus has come closer to industrial natural gas consumption in the Asian countries (121.6 bcm), which also holds the second position in the industrial natural gas consumption as at year-end 2009 (ca. 20% of the world level).

The share of African and South-East Asian countries in the world's industrial sector consumption of natural gas is relatively small, but also tends to grow.

Table 4 - Industrial sector natural gas consumption by the regions of the world

	unit	Year					Growth rate (+), Decline rate (-), %
		2005	2006	2007	2008	2009	
North America	cm	86.6	90.6	99.6	96.3	80.8	- 3
Latin America & Caribbean	cm	7.7	4.3	1.3	2.5	50.4	+5
Europe	cm	44.1	37.1	40.8	32.7	22.1	- 15
Africa	cm	9.3	1.8	3.0	2.9	22.7	+15
Middle-East	cm	7.6	5.8	5.5	7.1	94.6	+28.5

CIS	cm	8.1	9.6	6.9	01.4	89.9	- 8
Asia	cm	5.9	06.9	12.4	13.4	21.6	+21
Asia Pacific	cm	1.8	1.7	1.3	1.4	2.8	+8

The CIS countries (including Russia) tended to decrease in industrial sector natural gas consumption (some 8%) from 2005 to 2009. However, their share in the total world structure of industrial sector natural gas consumption was about 14%.

Based on the analysis of dynamics of natural gas by the industrial sector from 2005 to 2009, the world regions can be divided into two groups as follows (Table 4):

Those having a trend for increasing gas consumption:

- Latin America & Caribbean (by 5%),
- Africa (by 15%),
- Middle-East (by 28.5%),
- Asia (by 21%),
- Asia Pacific (by 8%).

Those having a trend for decreasing gas consumption:

- North America (by 3%),
- Europe (by 15%),
- CIS (by 8%).

Conclusion

The following tasks have been accomplished during the study:

- Results of analysis of the structure and dynamics of industrial sector natural gas consumption for 2005 – 2009 broken down by the countries of the world were formulated.
- Based on the statistics data, the structure and dynamics of natural gas consumption in various countries and the influence of economical, technological and other factors on them was compared.
- Prospects of industrial sector's natural gas use in the countries of the world were assessed;
- General guidelines and recommendations for efficient industrial use of natural gas were highlighted;
- Principal trends of natural gas use for the long-term perspective were defined.

Based on the study results, the table of natural gas consumption by the industry sectors in some countries of the world has been compiled (highest score: 1; lowest score: 11) as follows.

Region	Country	Sector of Industry
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		Iron and steel industry	Chemical industry	Non-metallic minerals mining	Mining industry	Mechanical engineering	Construction industry	Food manufacturing industry	Paper-and-pulp industry	Production of transport vehicles and equipment	Wood industry	Textile industry
North America	Canada									2		
	USA									7		
	Mexico									7		
Latin America	Venezuela									-		
	Brazil									-		
	Argentina									6		
Europe	Germany						0			7		
	Italy									-		
CIS	Russia									8	0	1
	Ukraine									7		0
Asia	China									5	1	0
	South Korea									3		
	Japan									-		
Africa										-		
Middle East										-		
Australia										-		

The global economy growth is the main factor for the increase in natural gas consumption, which causes the growth of the global industrial production, on the one hand, and consumer preferences and purchasing power of the population, on the other. High rates of demand for this energy resource in years to come are conditioned by its environmental friendliness, efficiency and maintainability.

According to some forecast, development of industrial production will be provided through increasing natural gas production. The highest growth rates of gas consumption will be in Asia (especially in China). In European and North American energy balance, due to plans to reduce carbon dioxide emissions, coal will be displaced by natural gas. The natural gas share in the global energy consumption will increase from 21 to 25%. As the production of electricity for industrial enterprises increases, demand for gas will grow due to reduction of coal use and nuclear energy share (because of increasing threat of accidents at nuclear power plants). 25 - 30% of growth in demand for gas will be provided by China. For the next 25 years, the demand in India will increase by 4 times, in the Middle East - by two times.

In conclusion, the following basic industry-wide activities that facilitate improvement of efficiency of industrial use of natural gas may be highlighted:

- Energy Survey - energy audit of an industrial enterprise in its entirety, as well as of single units or production operations.



- Energy Management - planning, management, control of energy flows and energy resource balance for the purposes of optimization thereof and improvement of efficiency of enterprises.
- Target energy monitoring.
- Policy of continuous (adequate) operational diagnostics of heat and power status of facilities using a special mobile complex.
- Creation and implementation of energy saving programmes for a single unit.