

Chapter 14

Gas Expansion and Development of Compressed and Cryogenic Technology Support

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Abstract Along with the national energy structure adjustment, natural gas consumption has risen opportunities for policy, the market of national city gas, CNG and LNG has faced the rapid expansion of the development situation and domestic provinces and cities and developed counties and gas markets have been developed and underdeveloped counties competing development situation. The rapid expansion and development of compressed gas and cryogenic technology support has become an important measure of the current implementation of rapid market expansion and improving economic aggregate, while actively corresponding national energy called and producing huge social benefits.

Keywords CNG · Capital operation · LNG · Property rights link

14.1 Introduction

Domestic gas business development prospects are very broad and it is expected to scale domestic gas utilization will reach billion cubic meters in 2015 and the proportion of energy consumption structure is expected from the current 3.9 to 8.3 %. Therefore, it is necessary to the gas business as downstream of the West-East business chain extension and ancillary services and treat it as oilfield

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company diversified development of core business development, as the big oil field economy gross main business and industry to replace one of the important contents of the oilfield, can be based on the oil field and extension of social.

14.2 The Significance of Gas Expansion and Development

It becomes the important factor of economic and social development of a strategy for tackling climate change. The State Council has printed and distributed ““Twelve Five” to Control Greenhouse Gas Emissions Program of Work”. The program has made clear to the national unit of gross domestic product in 2015 carbon dioxide emissions decreased by 17 % compared to 2010. It has proposed to the comprehensive utilization of a variety of control measures and strengthened organizational leadership and evaluation. In order to response to climate change policy system and further improve the institutional mechanisms, the further improve the institutional mechanisms, the greenhouse gas emission system of statistical business accounting has basically established and the carbon emissions trading market is gradually formed, It Actively develops a low-carbon energy, adjusts and optimizes the energy structure, promotes the use of clean coal and encourages the development and utilization of coal seam gas and natural gas. Non-fossil fuels in primary energy consumption ratio of 11.4 % based on ensuring the safety of development of nuclear power by 2015.

In recent years, the natural gas market of China in low-carbon economy is gradually warming up, natural gas consumption and growth rates have increased significantly. The average annual growth rate of China’s natural gas consumption by 13 % from 2000 to 2005 and average annual growth rate of 20 % from 2006 to 2010. In 2010, rapid increase in China’s natural gas consumption from 24.5 billion cubic meters in 2000 to 88.7 billion cubic meters (Gu 2004).

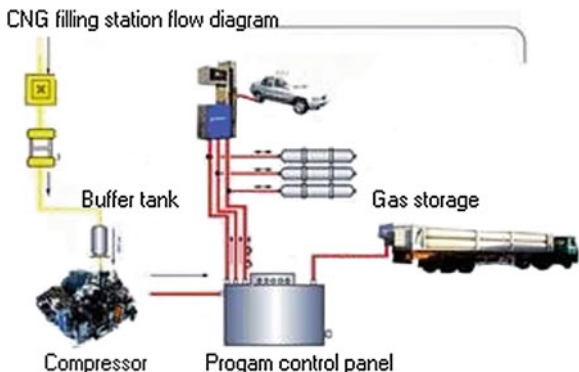
14.3 The Introduction of Compression and Cryogenic Technology

The main technical indicators: compressed natural gas, the pressure of 4 MPa, and economic transport radius of 100 km; 20 MPa high-pressure, economic transport radius of 300–400 km. Liquefied natural gas, cryogenic temperature of $-160\text{ }^{\circ}\text{C}$, low temperature storage and transportation economic radius of 800–900 km.

14.3.1 Compression Technology

CNG is compressed natural gas. Natural gas by filling stations after pressure from the compressor, the pressure to 20–25 Mpa after high-pressure depth of

Fig. 14.1 Compressed natural gas supply process



dewatering, filling tank car storage of the high pressure cylinder group, and then transported to various cities to enter the pipe network to residential users, business users and user supply natural gas to industrial enterprises (Jingxin 2009).

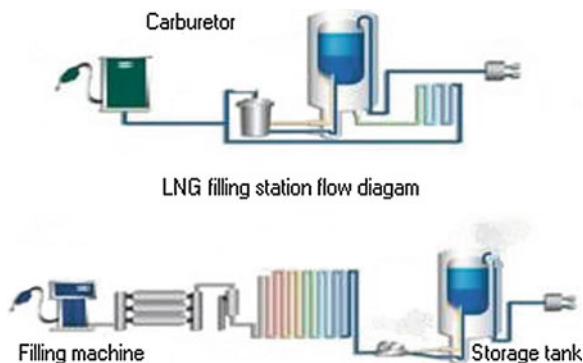
CNG urban gas supply system by taking the gas point pressure station, CNG cylinder vehicle, town gas unloading station, urban pipeline network composition, process flow diagrams illustrated below (Fig. 14.1).

Natural gas by measurement, first into the purification device after the regulator, removal of water, hydrogen sulfide, carbon dioxide, to meet the standard requirements. Pressurized by the compressor to 15–20 MPa, inflatable pressure station of the high pressure hose and quick connector to the CNG cylinder vehicle, when the cylinder pressure reaches the set value, the compressor automatically shut down. CNG cylinder vehicle transported by road to reach the town to unload the gas station by the high pressure gas unloading station and the quick joints unloading gas, CNG first to enter a heat exchanger heating (to prevent natural and natural gas temperature drop through the regulator decompression large, the normal operation of the follow-up equipment and pipe network), re-entering a regulator decompression, followed by two heat exchangers, two voltage regulators, three voltage regulator, the pressure transferred to the urban pipe network operating pressure, metering, odorization into the urban pipeline network (Shi et al. 2012; CNPC 2005). Unloading gas installations, heating and regulating progression to the maximum working pressure should be integrated cylinder vehicle, unloading gas capacity of the regulating device, the urban pipe network design pressure and other factors to determine.

14.3.2 Cryogenic Technology

Large-scale gas transmission pipeline is the most economical and most effective method of transport. In addition, you can also use two other transportation methods. In addition to the previous section introduced the CNG compressed

Fig. 14.2 LNG station car flow diagram



storage, there is another more effective delivery way LNG cryogenic liquefied storage.

LNG is a globally recognized clean energy, energy saving, environmental protection, safety, reliability, economic efficiency highlight a number of advantages. The so-called LNG is the English abbreviation for Liquefied Natural Gas LNG, translated into Chinese. Referred to as the LNG is a saying in English.

14.3.3 Access to LNG

LNG under low temperature, low pressure, liquid storage, transport and application, its density is about 620 times the gaseous, compressed natural gas, three times a single aerated sustainable travel 500–700 km, to meet the city bus, intercity bus long-distance heavy truck driving requirements and environmental protection, safe and reliable, has gradually become one of the main energy of the new energy market demand for China's automobile (Meng et al. 2009).

The main equipment of LNG station by low temperature storage tanks, LNG pump, LNG filling machine, saturation pressure regulator, unloading the supercharger, piping and accessories composition.

The main flow of LNG vehicle filling stations in the (Fig. 14.2).

14.4 Gas Expansion and Development of the Theory

14.4.1 Equity Financing Theory

The channels of corporate finance is divided into two categories: debt financing and equity financing. The former includes bank loans, issue bonds and notes payable, accounts payable, the latter mainly refers to the equity financing. Of debt financing liabilities to repay principal and interest agreed, creditors generally do

not participate in the business decision, no decision-making on the use of funds. Of equity financing of own funds of enterprises, investors have the right to participate in the business decision-making, the right to obtain the dividends of the enterprise, but not to the withdrawal of funds.

The main advantages of equity financing: the financing to attract equity capital. Therefore, the corporate equity return of dividend even small spending pressures and enhance the ability to resist risks. If we can attract a strategic investor with a specific resource, you can also use the advantage of the management of strategic investors, financial strength, market channel advantages, the advantage of government relations, and technical advantages of the synergistic effect, the rapid growth of their own strength (Young in January 2004).

The biggest risk of equity financing is that the shares dilution may lose control of the company, part of the usufruct, or even in the corporate strategy and business objectives, management methods and new share holders have significant differences which led to difficulties in business as well as split.

14.4.2 Capital Operation Theory as the Core of Property Rights Link

Capital operation capital owners and their authorized representatives, optimize the allocation of its owned or managed by the factors of production to the form of value and rational flow, so as to achieve a management methods to maximize profits and to promote capital's largest value-added target the connotation of capital operation, capital operation principle is to ensure safety, efficiency and liquidity of capital.

Capital operation includes two levels: First, the micro-level, look at from the perspective of business management, and enterprise they have every resource, each of which factors of production are seen as added value requirements through a variety of management, effective way to achieve its profit and value-added goal of maximizing; macro-level perspective of a reasonable configuration from resource optimization, all social resources, factors of production as to add value the value to enter the market, with a value-added purpose and relationship to other capital elements, their added value depends on the degree of optimization of their entry into the capital structure, the various elements of this capital operation task is to unrelated organization to a specific capital structure, and optimize the capital structure, capital appreciation (Yu 2012).

The essence of property rights of capital operation as a link, to promote the optimal allocation of factors of production and reasonable flow to achieve maximum capital value-added target; the form of capital operations are diverse, both rely on capital markets, capital operation, there are capital market flow into the restructuring of the invisible market outside the capital and property rights. More common, including shareholding, joint ventures, mergers, bankruptcy, auction,

sale, leasing, and the above manner is different, and its use due to the operation of different objects, the differences in subjective and objective conditions vary widely, and in the process of capital operation and display their talents (Li 2012; Sun 2004).

14.5 The Application of the Huabei Oilfield Company

14.5.1 Application Process

1. Through CNG and LNG technology widespread application, effectively expanding the gas business supply economic radius, realize the overall market layout of gas business. Hebei Oilfield Company gas business in accordance with the existing natural gas resources, and actively develop the gas source around the CNG and LNG filling stations in the market to drive in Beijing, Tianjin, Hebei, East China province, city gas development and utilization of the overall development of ideas, through wholly owned or joint venture to build station in the region of Central Hebei and Beijing, Tianjin formation of CNG, LNG and gas network; In the northern Hebei Province and Tianjin region, focusing on regional planning establishment of Binhai New Area and Tianjin Port to form a complete filling network; in the region of southern Hebei and Shanxi Jincheng coal bed methane as the core to the city bus, passenger, freight lines the main line, the radiation filling network of Shanxi, the whole territory of the South Area; vast region in eastern China, Jiangsu, Zhejiang, Anhui and southern regional focus on the formation of LNG filling network, then radiation the Huadong five provinces and one municipality. It is on the basis of the widely used CNG and LNG technology, making the gas business based in North China, the National Radiation, “the overall layout of the market is able to start (Sun et al. 2006).

After the statistics, as of the end of 2011, the target market in the operation of door station 4, station 13, is nearly 1,000 LNG car with gas service.

2. Through equity financing to complete the integration of interbank absorb advantages funds, and grow the strength of enterprises. As of the end of 2011, through equity financing working capital soared from 200 million yuan to 10 billion yuan, to achieve a combination of complementary resources and capital laid an important foundation for the realization of mutually beneficial cooperation and win-win development.
3. Through the capital operation, the establishment of cooperative relations, property rights as a link to achieve a comprehensive in-depth development of the gas market. To carry out gas business at the beginning of, facing the situation is all a city and most of the county level city pipeline gas and CNG market has saturated, the LNG as an emerging business although the market

potential is tremendous, but LNG business investment is large and the new energy understanding and recognition degree is insufficient, the market development work is very difficult. Through capital operation, the introduction of a number of capital market advantages, or government policies advantage of strategic partners to achieve a powerful combination of complementary advantages, so that the gas business to open up the situation quickly. A few short years, the establishment of the nearly 60 equity firms, pipeline gas, CNG and LNG business throughout the country, has successfully achieved the secondary development of both market and the strategic layout of the new business market.

14.5.2 Program Effectiveness Evaluation

2011, Huabei Oilfield annual sales of nearly 800 million cubic of natural gas; more than one million tons of sales of liquefied petroleum gas; sales of nearly 100,000 tons LNG; achieved operating income of nearly \$ billion; net profit of a billion dollars.

Placement effectiveness is obvious. The 2011 total gas business staff of nearly 2,000 people, more than 2-fold increase over 2010.

The contribution to the society gradually. The annual fees and taxes, to break through 100 million yuan, grow 20 % than 2010.

Annual sales of natural gas, CNG and LNG can reduce carbon dioxide emissions of 319.55 million tons, and have a huge “reduction” benefits.

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