

Safety system of Natural gas pipeline

Contents

- Introduction
- Natural gas pipeline system
- Statistics and causes of accident from pipeline system
- Harm from the rupture and leak of gas pipeline
- The benefit of natural gas pipeline transportation
- Conclusion

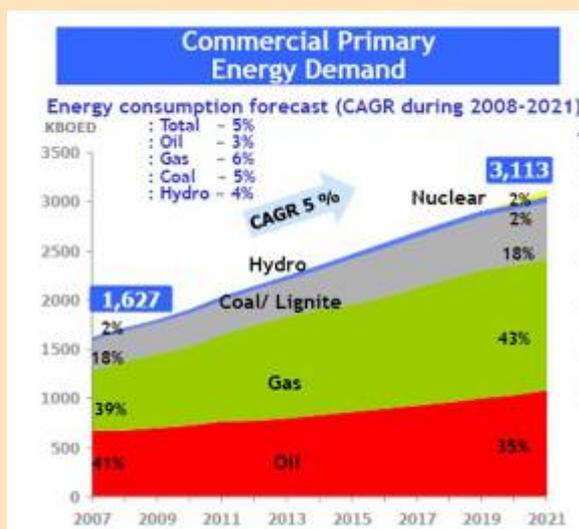




Introduction

For the past 150 years, natural gas has been playing a vital role in all aspects of development especially the use of natural gas to replace coal and oil. Due to its distinct property of natural gas which differs from other types of petroleum fuel, **the natural gas** has been well accepted as the energy of choice for today and future. Because the world needs not only the energy that drives the economy but the energy that also protects the environment.

The natural gas provides heat and light; it is used as a fuel for power generation, transportation, industry, agriculture and starting raw material for petrochemical industry and also in the cooling system.



Trend of energy consumption in Thailand between 2008-2021

The illustration shows the trend of natural gas usage which is on a rise for the next 10 years; while the energy consumption grows at a rate of 5% CAGR (Compound Annual Growth Rate). Natural gas will be the choice of energy as representing growth rate 6% per annum during the year 2008-2021.

The three main factors contributing to such phenomenon are increasing oil price, clean and environmental friendly of natural gas and advanced technology of the natural gas. As a result, the access to natural gas usage has no longer been limited to the countries away from the field.



The key reasons why natural gas has stepped up to be a mainstream energy resource of the century are due to the followings.

- It is a petroleum fuel with highest efficiency, clean burning.
- It minimizes the greenhouse effect which is a cause of global warming.
- It is safe to use.
- It is relatively cheaper than other petroleum-based fuels such as oil, fuel oil and LPG.
- It can add value and drive economy of the country.
- Most of natural gas is locally produced.





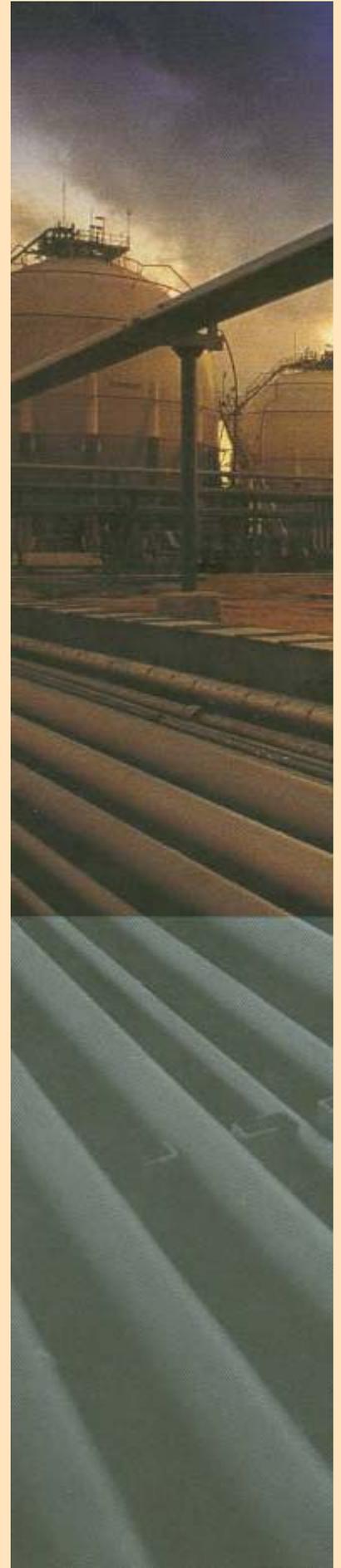
Natural gas pipeline system

The demand for natural gas keeps rising while the production is limited. As natural gas combustible, flammable and explosive, handing of fuel requires utmost care with highly efficient transportation system and least loss during transit. **Therefore, the transportation via pipeline is the most suitable** as its efficient and has been developed continuously. Most of all, it is separated from mass transportation.

Natural gas pipeline system evolved in 900 BC. It was recorded that the Chinese used the bamboo cylinder to transport natural gas. In the United States, the first recovery of natural gas was in 1816 or 192 years ago. The gas is used to light up the road in Baltimore, Maryland State. Later, a success of more gas discovery heralded an era of active pipeline construction, especially during a period of 1920 until the Second World War in 1939. Today the natural gas pipeline stretches over a distance of one million kilometers around the world; half of which is in the United States and one fourth is in Western Europe.

In Thailand, the pipeline system has been in use for over 25 years. The Petroleum Authority of Thailand or PTT Public Company Limited was assigned to lay a 425 km-pipeline from Erawan Gas Field to come ashore at Rayong. The onshore gas laid along the main road is extended to the customers e.g. Bangpakong Combined Cycle Power Plant and other industries. The pipe's diameter varies in accordance with the sale volume. At present the pipeline in Thailand covers a distance of over 3,100 kilometers.

Throughout the network, the pipeline full of natural gas is ready to deliver the gas around the clock. Method of sending gas from higher to lower pressure is applied as the gas is delivered through the pipe with a diameter from 4-42 inches operating at 200-1870 psi or 140 times over normal air pressure. As the pipeline runs through agricultural area, community area, along highway, the disturbance from the third party may cause the accident and danger.





Statistics and causes of accident from pipeline system

PTT has placed a high priority on safety in operating the natural gas pipeline system. In every step, PTT stipulates the minimum required safety practices starting from planning, design, construction, operation and maintenance in order to ensure the confidence and highest safety of **community** and **society**.

From data collection regarding accident from the natural gas pipeline, the main cause of rupture and leak of the pipeline is by the third party. As a result, it is necessary for concerned parties to learn the information, properties, benefit and harm as well as the correct procedure.

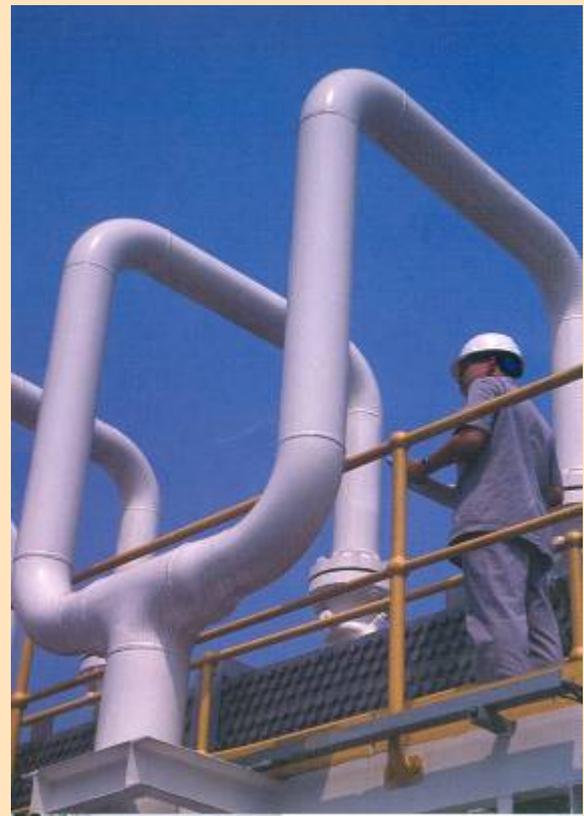


The probable cause of accidents

1. **From the pipeline:** The accident of the pipeline may come from a chemical reaction resulting in internal corrosion as the natural gas has sulfur dioxide or sour gas. The external corrosion results from defects of coating material and cathodic protection method.
2. **From the third party:** For instance, the pillar drill or the use of heavy machine to hammer and/or dig the ground where the pipeline is buried may disturb the pipe.
3. **From natural disaster:** For instance, the severe earthquake and the land subsidence can cause serious damage to the pipe.



PTT has collected data on pipeline accident and found that since the commencement of the natural gas pipeline during a 25 year period (1981-2006), there is no serious accident causing death or injury. Most of accidents are caused by third party or external factors. For each accident, immediate action always took place to solve the problem.



Harm from the rupture and leak of gas pipeline

Natural gas is flammable, colorless, odorless and non-toxic. However, during natural gas transportation or separation process, natural gas in pipeline may contain heavy hydrocarbons e.g. hexane, pentane, and others. Or in case of sour gas, which contain sulfur, may cause some smell, beside the adding odorant to warn the consumers if pipe leak. The leak or rupture of the pipe will lead to the following conditions:

Smell / lack of oxygen When the pipe is leaked, the gas will disperse in the air, which can cause dizziness for people who inhale. For people inhaling natural gas for a long time, they must be evacuated to get clean air and receive artificial respiration and be sent to hospital. According to the safety standard of natural gas, the odorant must be added in the gas to allow people to detect in case of leaks. In principle, the odorant must not change the quality of the gas. Typically, Mercaptan which smells like a rotten egg is added in the gas.

Noise the National Environmental Board specifies the noise quality standard in the announcement of National Environmental Board No.15 (BE2450) that it shall not exceed 70 decibels. When the pipe leaks with high pressure, people should be evacuated to prevent their hearing affected.

Pressure As the pipe contains high-pressured gas; it can cause accident to the people who stay near to the pipe or the high pressured gas directly comes into contact and may cause injury or death.

Heat and fire The chance of flammability of the gas is slim when leaked by force majeure as the pipe is buried deeply underground. In addition, the block valves and other equipments are located in the open space. The chance of natural gas leak and flammability depends on factors below:

Flash point 188⁰C

Flammability range 5-15% of the air content

Self-ignition temperature 537-540⁰C

Flammability ratio (air:gas) 10:1

The pipe natural gas may cause any harm; therefore after the backfill the pipeline sign must be marked with the telephone number of PTT to inform the incident which is the preliminary measure for the joint collaboration in using energy with safety and efficiency.





Cessation of an accident

The pipeline system in Thailand covering a distance over 3,000 kilometers running from the Gulf of Thailand, onshore field in Khonkean and Udonthani as well as Yadana and Yetagun from Myanmar laid on seabed, along the highway, under the high voltage line, forest area, communities, agricultural area, the industrial estate, to bring gas from underground to be fully utilized for the utmost benefit.

The pipeline in every area is under close safety measure supervision. The Block Valve station is established to control gas flow of every network. The Safety officers are assigned to work 24 hours. Also each network is under control of the operation center specifically designated for the operations. All of them are centrally controlled by Chonburi Operations Center, Chonburi Province.

Nevertheless, for maximum security and safety of the pipeline, PTT has prepared an emergency response plan as a practice guideline to minimize the damage for people, community, and environment as well as to resume to the normal condition as fast as possible.



What public should practice in an accident of pipeline rupture, leak or burst

1. Evacuate the people and proceed to windward area.
2. Do not drive into the vapor cloud.
3. Eliminate the ignition sources or heat which will cause ignition including starting an engine and switching lights on or off.
4. Immediately call PTT phone number as stated in the marker sign, provide the personnel with the information on detailed location and type of leak.

INSURANCE

PTT make legally - required insurance for life, property of the third party affecting from the accident caused by PTT's operation for 50 million US\$ per each accident. The compensation is based on the status of damage.



The benefit of natural gas pipeline transportation

The transportation applies the means of transmitting gas from higher pressure to lower pressure.

1. Pipelines are the most efficient and reliable way to transport energy products, and reduce loss of the energy during transportation.
2. Extremely safe due to the international standard procedure of operation and maintenance.
3. No consequence to the environment and community after the construction
 - The gas temperature in the pipeline is the same as the soil around the pipe.
 - The flow of the gas from underground pipeline is noiseless and does not disturb the community.
 - The pipeline can reduce traffic of the normal transportation.
4. The pipeline brings down the investment cost for industries using natural gas in the long term as it requires no storage (no tankage to store the fuel is necessary).
5. The pipeline can continuously transport a large volume of the gas.





Conclusion

Generally, it has been accepted that transporting natural gas through pipeline is one of the safest and most reliable modes due to the long intensive development for over a century. By pipeline, the gas is unlikely to lose during transportation and able to delivered in a large volume. The transmission is convenient and speedy. Most of all, the pipeline helps reduce traffic problem, road accidents as well as air pollution because the entire system is isolated from mass transportation modes.

In addition, in running the system, the priority has been placed on the **people** and **community**. The standard design, the service of the pipe, the maintenance have been well planned in order to ensure the efficient operations with maximum safety.

However, the gas in the pipe is flammable and explosive; there is thus a chance for accident like other modes of transportation. The accident record of the pipeline somewhat shows a least risk factor of exposing to a serious harm or death. As it is noticeable that most causes of accident of pipeline are derived from the third party damage, the public and concerned party should thus involve in looking after the pipeline, which are the public property to be in a perfect condition for operation as well as strictly follow the safety rules.

**If found the natural gas pipeline leaked or damage,
please call PTT to report at 0-3827-4399
or 1800-555-666 (from TOT telephone) and 1410-555-666 (from cell phone).**