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PEOPLE'S REPUBLIC OF CHINA**

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Standard specification for LNG density calculation models

液化天然气密度计算模型规范

(English Translation)

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Foreword

This standard is identical with ASTM D4784-93 (Reapproved 2003), Standard Specification for LNG Density Calculation Models (LNG density calculation model specification). This standard is equivalent translation ASTM D4784-93 (Reapproved 2003). This standard does not exclude the use of models and methods equal or exceed the requirements of this standard; under identical conditions, the editorial changes to adapt to China Standard layout.

For ease of use of this standard, the following editorial changes.

--- Increase preface to adapt our standard format;

--- Cancel fixed reference standard instructions and ASTM International statement.

This standard by the National Standardization Technical Committee on Gas (SAC/TC244) and focal points.

This standard drafting unit. China Petrochemical Corporation Zhongyuan Petroleum Exploration Bureau of Survey and Design Institute.

Participated in the drafting of this Standard. China Petroleum Engineering Co., Ltd. Southwest Branch.

Introduction

This standard is four mathematical model to describe the LNG mixture equation of state. The four models include extended state model comparison, hives (Cel) Model, hard ball (Hardsphere) model and modified Claudia Gdansk - McKinley (Klosek-McKinley) model. Each model uses the same experimental data, including data in pure nitrogen, methane, ethane, propane, isobutane and n-butane, iso-pentane, and n-pentane, and mixtures thereof.

For LNG mixture (liquid mixture of 120K or lower temperature, and containing at least 60%

methane, less than 4% nitrogen, iso Butane and butane amount of each is less than 4%, pentane and iso-pentane is less than 4% of the total), all models predict the density difference between the true value within 0.1%.

These models by the American Institute of Standards and Technology (formerly the American Bureau of Standards) development, after seven years of efforts, the use of a lot of special equipment the test measures the acquisition of data and use these data to develop predictive models for density calculations.

LNG density calculation model specification 1)

1 Scope

LNG density calculation model 1.1 standard covered by 2) for a given pressure, temperature, and the mixture case, a mixture of saturated LNG Density was calculated or predicted in 90K ~ 120K, calculate the deviation from the true value is within 0.1%.

1.2

This standard is not intended to cover security, if any, associated with the use of the standard. Establish appropriate safety and health practices and determine the limit before use the applicability of a given condition, is the responsibility of the user of this standard.

2 Characteristics and use

2.1

standard model can be used to calculate the temperature of the saturated liquid density 90K ~ 120K of natural gas. Inaccurate estimation of density calculation Given the degree is $\pm 0.1\%$. NGL component limits are as follows.

Methane is equal to or greater than 60% Less than 4% nitrogen Less than 4% n-butane Isobutane less than 4% Less than 2% pentane Assume C6 or C6 + hydrocarbons in the LNG solution does not exist.

3 Model

3.1

Comparison extended state --- extended state comparison method by the following equation.

Where.

Z --- compression factor;

--- The G Gibbs free energy;

P --- pressure;

T --- the temperature;

1) ASTM D4784 centralized gas fuel in ASTM D-3 committees, by the thermal properties D03.08 subcommittee directly responsible.

Current version approved in May 10, 2003. Published in May 2003. Originally approved in 1988, the previous version approved by ASTM in 1998 D4784-93 (1998).

2) formulas and models supporting work by the US Bureau of Standards completed, British Gas Corp, Chicago Bridge and Iron Co. , Columbia Gas Service Corp. , Distrigas Corp. , Easco Gas LNG, Inc. , El Paso Natural Gas, Gaz de France, Marathon Oil Co. , Mobil Oil Corp. , Natural Gas Pipeline Co. , Philips Petroleum Co. , Shell International Gas, Ltd. , Sonatrach, Southern California Gas Co. , Tennessee Gas Pipeline, Texas Eastern Transmission Co. , Tokyo Gas Co. , Ltd. And Transcontinental Gas Pipeline Corp. Sponsorship funds managed by the American Gas Association.

There are two transfer function is defined by equation (1) and equation (2) it is necessary. In this case, choose methane as the reference equation of state fluid. During the study, the equation of state must be modified in order to obtain a low temperature to 43K actual vapor-liquid boundary. In order to adapt to the heavy hydrocarbons is very low